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CONTENTS.

	PAGE.
East Africa	165
Forest Fire Protection	167
Colonial Policy	170
The College Sugar Factory	172
Quality of Cacao	172
East African Development	174
The College	175
Tropical World Notes	176
The Isoelectric Theory	179
Empire Cotton	182
Banana Cultivation	184
Cotton Research	185
Book Reviews	187
College News	187
Trend of the Markets	188
Empire Sugar Federation	188

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EAST AFRICA.

HIS MAJESTY'S Stationery Office has recently published the report of the East African Commission*, composed of the Hon. W. Ormsby-Gore, M.P., Chairman, Major A. G. Church, and Mr. F. C. Linfield. The Report covers Northern Rhodesia, Nyasaland, Tanganyika Territory, Kenya and Uganda on the mainland, and the islands of Zanzibar and Pemba. This comprehensive tour was accomplished within a remarkable short period of time in spite of which the Report betrays few signs of hasty conclusions drawn upon inadequate study.

Two main problems emerge from the Report—transportation and population. These two problems are largely interdependent since roads, railways and other means of transport are not, as in already highly organised countries, constructed to serve the needs of an existing population, but in effect create and maintain population. The most alarming feature is the fact that population in these various territories is either increasing at an extremely slow rate, or remaining stationary or actually decreasing. Progress ultimately depends upon an adequate, healthy and contented labour supply. Lord Balfour—who described the Report as "an epoch-making document in many respects"—instanced the ravages of the tsetse fly and demonstrated how it retarded progress.

Mr. Ormsby-Gore recently dwelt upon this problem in his opening address to the League of Nations Conference on Sleeping Sickness in Africa. The object of the Conference is to consider the possibility of despatching an international commission to equatorial Africa to investigate the problem. Attention has previously been focussed on the question and much useful knowledge has been accumulated by investigations of different nations. Much still remains to be done for authorities are still at variance upon important aspects of the problem. The question is not, however, entirely a medical one, indeed more remains to be accomplished on the administrative side than on the medical. The proposed commission, with adequate financial and official support, should be capable of solving many medical and administrative problems and of laying down definite lines of policy which, persistently pursued, would at least mitigate the worst evils of the existing situation and make life possible for both man and beast within areas now dominated by the tsetse fly. At present the tendency is in the opposite direction and yearly areas have to be given over to the conquering fly. While man remains subservient to the insect comprehensive economic development is impossible.

The other main problem concerns transport. The Report deals fully and comprehensively with the individual and collective needs of these areas. Emphasis is laid upon new railway construction. An adequate railway system would not only release new sources of raw materials but would also materially assist the administrative problem of dealing with the tsetse fly. Incidentally the railway engine is, unlike the animal, impervious to the insect! The detailed recommendations of construction should be studied in the Report. The Commission recommends an East African Transport Guarantee Bill authorizing the issue of a loan for £10,000,000, guaranteed as to principal and interest by the Imperial Government and ranking as trustee security. Such money would be advanced at the discretion of the Secretary of

* Cmd. 2387 H. M. Stationery Office, price 3/6, 195 pages.

State for the Colonies on projects for railway extension, harbour developments, construction of main roads and mechanical transport. It is suggested that during the period of construction the interest should be paid by the Imperial Exchequer and after that date by the services themselves or, failing sufficient revenue from this source, from the revenues of the Territories concerned. Repayment of interest should begin after a period of ten years.

Hand in hand with material progress must go education, and it is in connection with this problem that the greatest circumspection must be exercised notably to avoid the mischievous system introduced by Macaulay into India. Such a capital error repeated in East Africa would be fraught with consequences of a most unfortunate nature. Fortunately we have the benefit of the work of the Phelps-Stokes Educational Commission to West and now East Africa under the Chairmanship of Dr. T. Jesse Jones. Upon the latter Report we hope to offer some comments and criticisms in a future issue.

At the end of the Kenya debate in the House of Lords, Lord Balfour made a pronouncement of first rate importance, namely, that the Government would set up a Committee on lines similar to that of the Committee of Imperial Defence "for dealing with purely civilian problems, which are more and more insistent in connection with Imperial development." Such a Committee would of course have no executive power but would "provide machinery for examining problems for which at present there is no departmental method of dealing . . . These problems require to be dealt with in a wider spirit and with a greater command of scientific methods than we can at present find at our disposal." We congratulate the Government upon this decision and note with satisfaction that the scheme adumbrated by Lord Balfour received the approval of Lord Olivier, a man of a highly different political complexion and one with considerable colonial experience. The view has been expressed in certain quarters that "Colonial administration suffers from apoplexy at the centre and anaemia at the extremities"—the Colonial Office, immersed in day to day problems and with its Parliamentary Heads exposed to the full fury of political storms, is unable to view these problems with the absence of political bias and unprejudiced foresight that they demand. We join with Lord Balfour in expressing the hope that "this is no barren scheme, an imaginative dream—but that it will be really fraught with consequences of a most productive character." A Committee is often utilised by harassed ministers as a convenient method of shelving embarassing questions but the present suggestion is of such importance that it is evident that full use will be made of its incalculable value in directing the strength of Great Britain to the greatest advantage in her immense administrative tasks overseas.

In conclusion we desire to draw attention to the paragraph on the famous Amani Institute of research founded in Tanganyika by the Germans in 1902. The German Government expended £120,000 on this station which the Commissioners describe as being superior to any corresponding institution in any British Colony, and comparable only with Buitenzorg in Java. To-day "it is for all practical purposes, lying derelict. Instead of supplying the five territories in particular, and the scientific world in general, with contributions to their knowledge of Tropical plants, soils, insects—of the greatest scientific and economic importance—its only output at present consists of penny packets of seeds."

We propose to comment on this subject more fully in a subsequent issue but it is perhaps necessary to add that blame cannot definitely be laid at the door of any of the territories concerned. In 1920 Sir David Prain presented a report on the re-organisation of the Institute to the late Lord Milner proposing its re-establishment as a Central Research Institution, the initial expenses and upkeep to be apportioned between the territories concerned, with the promise of "a substantial grant" from the funds of the Colonial Research Committee. Tanganyika and Uganda were wholly favourable while Zanzibar was prepared to make the contribution asked for in spite of doubts as to the value of the Institute to the island. After some delay Kenya agreed to contribute only one-fifth of the sum required, while Nyasaland made no provision, pleading poverty and remoteness from the Institute. Similar plans broke down in 1922, with the result that for the time being Tanganyika bore an impossible burden alone. At the moment we need add nothing further except to state that the attitude of the Government of Tanganyika, upon which blame has been showered from certain quarters, has been wholly commendable.

A mere handful of distinguished men sent out by the Colonial Office to Africa, and the majority fortunately still with us, save us from the world's reproach concerning our administration of tropical Africa. They succeeded in the past not because of, but in spite of, home support. It is evident from the history of the last quarter of a century that this will no longer be the case. While we wish to see broad lines of policy laid down they must of necessity and also of choice be sufficiently broad and elastic to enable our administrators to show their mettle. Our whole Colonial tradition is that of the individual man and company. We desire to see nothing introduced that will render the work of the individual more difficult but rather that organised science should be placed at his command. Mr. Ormsby-Gore, as Under-Secretary of State for the Colonies should be able to secure the adoption of the proposals of the Commission which would in large measure remedy the various maladies he and his colleagues were sent to investigate. In so doing he would, we feel sure, receive support from all sides of the House, and earn the approbation of East Africa in particular and the tropical world in general.

FOREST FIRE PROTECTION.

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FOREST fires, both in tropical and in temperate regions, constitute so great a menace to the welfare of the forest that fire protection may be generally regarded as an essential preliminary to successful forest management. In the great coniferous forests of British Columbia it has been said—probably with reason—that for every tree utilized over twenty trees are consumed by fire: there can in fact be no question that the future conservation and management of the forests of North America generally must be based primarily on their effective protection from fire. In the tropics the effects of fire are equally serious under certain conditions, the amount of damage depending largely on the type of forest and particularly on the amount of inflammable undergrowth present. The moister types of rain forest do not as a rule burn unless heavy fellings and shifting cultivation have produced openings littered with inflammable débris: if a fire does occur under such conditions the effect may be disastrous, since the trees of the rain forest are ill adapted to withstand the effects of fire and are often killed outright. Savannah forests, on the other hand, are swept annually or at frequent intervals by fires of great intensity which rage through the soil-covering of tall grasses at the driest season of the year, and none but the most fire resistant species of trees are able to survive. In the case of a light leaf fire creeping slowly along the surface of the ground and only occasionally bursting forth where patches of grass are met with, the visible damage done may be slight, and many of the deciduous monsoon forests of Burma, Siam and adjacent regions are regularly traversed by such fires. Even in this case, however, the cumulative effects of the fires, in causing hollows at the base of the trees, and in other ways, are by no means negligible.

The damage done by forest fires may extend to the complete destruction of trees of all sizes, as happens in the case of crown fires or where there is a heavy inflammable undergrowth. Coniferous forests usually suffer more than broad leaved forests, while young forest crops are particularly subject to complete destruction, and may require special measures to ensure their safety. Even where the trees are not actually killed they may be so weakened by fire as to be rendered prone to insect attacks; this is particularly the case in coniferous forests, where fires are commonly followed by serious infestations of bark-beetles. Fire may, without causing any appreciable damage to tree-growth, result in the prevention of natural regeneration by destroying seedlings and young saplings. On the other hand it does not necessarily follow that fire protection will result in the regeneration of the species most desired. Thus in the moister types of teak forest in Burma, teak is capable of regenerating freely in spite of periodical leaf fires, owing to the fire-resisting capacity of the young plants; continued fire-protection, on the other hand, has been found to result in a complete absence of teak regeneration owing to the encouragement given to less fire-resistant competitors which have formed an undergrowth dense enough to suppress and kill out any teak seedlings that may appear. A similar result has occurred in the moister types of sál (*Shorea robusta*) forest in north-eastern India, where continued fire-protection has caused the establishment of a heavy evergreen undergrowth and has altered the soil conditions to such an extent that sál regeneration is unable to establish itself. It may be conceded, then, that whereas fire may generally be regarded as a destructive agency so far as forests are concerned, there are cases in which it may even act beneficially as an aid towards the regeneration of certain types of forest. This does not alter the fact that the protection of forests from fire is one of the most important duties with which the forester is confronted, and we may now consider some of the causes of forest fires and the main steps to be taken towards ensuring at least some degree of success in the protection of forests from fire.

Forest fires originate from many different causes. In the majority of cases they are due to carelessness, as when camp fires are left smouldering, lighted cigarette-ends are thoughtlessly thrown away amongst inflammable undergrowth, or insufficient precautions are taken during the burning of rubbish on adjacent lands, to prevent fire from spreading into the forest. Intentional fires may be due to malicious incendiarism or to such causes as the firing of the forest to drive out game or to burn off dead grass in order to obtain better grazing. In the Himalaya it is a regular custom among graziers to burn the dry grass in the pine forests every year, not merely to obtain young and tender grass but also to destroy the layer of pine needles, which cause the cattle to slip on the steep hill-sides and break their legs. Among primitive tribes the smoking out of bees' nests in the forest is an occasional cause of fire. Sparks from railway engines not infrequently cause forest fires, although this can be largely guarded against by the use of spark-arrestors. Lightning is sometimes mentioned as a cause of forest fires, while a case has been recorded from India of a fire which originated from sparks caused by a boulder rolling down a steep hill-side and striking against stones on the way.

Turning now to measures which may be adopted for preventing forest fires, the first essential is to provide the necessary legislation for enforcing protection, suitable penalties being provided in cases of fire arising through incendiarism or carelessness. Such legislation is now in force in many parts of the Empire. It may not be generally known that in England legislation of this kind dates back from the early Middle

Ages, for in the seventh century the law of Ine, King of Wessex, laid down that the burning of a single tree in the forest was punishable with a fine of sixty shillings.

Legislation, however, will never in itself secure protection from fire, and may be regarded as nothing more than a means of enforcing other measure of a more direct kind. Such measures, unless their aims are fully understood, are likely to be unpopular, and hence the necessity for securing the co-operation of all persons visiting the forests or living in or near them, and for making known the aims and objects of fire protection as widely as possible. Among the more primitive peoples this can best be effected by a sympathetic understanding between the people and the forest staff, and by the posting up of vernacular notices along roads and paths and in villages near the forest during the fire season. In Canada and the United States propaganda work of a most elaborate kind is carried on through the medium of the press and the post office, while during the fire season the forests are decorated with lurid posters displaying exhortations and warnings in concise but forcible phraseology. In Canada there is a special railway coach fitted up with models giving demonstrations of the disastrous effects of forest fires ; this coach travels along the railway lines doing useful work in providing demonstrations to travellers.

Efficient fire-protective measures in the tropics usually involve the maintenance of a system of firelines comprising an external line round the forest boundary, to prevent the ingress of fire from without, and a series of internal lines dividing the forest into convenient-sized blocks in order to localize any fires that may originate inside the forest or gain admission from outside. Where practicable, such firelines may advantageously follow roads and paths, and where streams or dry water-courses of sufficient breadth are available these may be used as natural firelines. Even with a groundwork of such natural firelines, it is almost always necessary to complete the system with artificial lines, and where natural lines do not exist the whole system will consist of artificial firelines. The nature and breadth of these latter varies as a rule with the amount of inflammable undergrowth present. A low leaf fire on a calm day may be stopped by nothing more than a footpath a couple of feet wide, while on the other hand a clear line two or three hundred feet wide would be quite ineffective in stopping a fire raging through tall grass and inflammable matter in a high wind, when blazing tufts of grass and débris are whirled through the air at high speed. It may therefore be said that firelines, although intended to stop all fires of ordinary intensity, cannot always be regarded as automatic checks ; on the other hand they form effective lines for patrolling and for hurrying men to the scene of a fire, and they also form suitable bases for counterfiring if necessary. In India the commonest form of firelines is 100 feet broad, completely cleared of tree-growth. Such firelines, which become covered with tall grass, are burnt annually at the beginning of the fire season, guide lines about 4 feet wide being first cut along either edge of the fireline. The burning, which is usually begun on a still evening and continued through the night, is started along the guide lines and proceeds inwards towards the centre of the fireline, the draught thereby created producing an intense fire : sometimes the fireline is burnt in sections, in order the better to control the burning, cross-lines being cut at intervals. In Burma a common form of fireline is one consisting of a swept line running through the forest under the trees, no clearing of tree-growth being carried out. In the deciduous forests of that country these firelines require constant sweeping throughout the fire-season, since the leaves of trees and bamboos are shed at that time of the year. Little has been done so far in the way of establishing, in lieu of firelines, belts of trees which produce heavy shade and kill out undergrowth, or belts of non-inflammable undergrowth : there should be possibilities in this direction if suitable shade trees can be found for particular localities.

Controlled burning early in the fire-season is an important operation. This may take the form of burning open grasslands within the forest in order to reduce the amount of inflammable matter present, guide lines being first cut round their margins, or burning the undergrowth along a safety strip through the forest on either side of a railway line or road, this strip varying in width according to requirements and being bounded by guide-lines from which the burning is begun. An important form of controlled burning is carried out in some of the inflammable pine forests of the Himalaya. It is realized that complete fire-protection is out of the question, since the local graziers cling to their immemorial custom of burning the old dry grass, and repressive measures only lead to incendiary fires : hence by arrangement with the graziers all young pine crops are carefully fire-protected on condition that those portions of the forest which are old enough to escape serious damage and are not under regeneration are burnt annually under control ; the damage is minimized by burning early in the fire season and downhill.

Patrolling, watching, and the reporting of fires is a necessary and important part of organized fire-protection. In its simplest form this consists of appointing fire patrols for given areas of country or lengths of line, their duty being to patrol the firelines, give timely warning of the outbreak of fire and endeavour to trace the origin of any fire with the view of taking legal action if necessary. Elevated positions are chosen as vantage points for watching, and a common procedure is to erect wooden watch-towers from the top of which a wide view can be obtained. The work of locating and reporting

fires is much facilitated if there is a series of watch-towers connected by telephone with a central station. Each watch-tower is provided with a table on which the points of the compass are marked out. With the aid of a sight-vane the watcher determines the bearing of any fire noticed and at once reports it by telephone to the central station, and if bearings from one or more other watch-towers are also received at the station the fire can be located accurately by the intersection of the bearings.

In Canada great strides have been made in recent years with the use of aircraft fitted with wireless apparatus for detecting and reporting forest fires. The number of lakes in the forest regions of that country renders the employment of hydroplanes practicable: these can patrol a wide extent of country and give timely warning of the outbreak of fire.

Assuming that a fire has been reported, everything now depends on the speed with which a sufficient labour force can be hurried to the spot, since every hour may make a great difference to the extent of the fire to be fought and the amount of damage done. The value of good communications, and a sufficient labour supply, and the difficulty of dealing with fires in large tracts of wild uninhabited country without good communications, will thus be readily appreciated.

Assuming that men have arrived at the scene of a fire, the usual procedure is for parties to attack the fire from either end of the line, beating it out with green boughs into a narrowing wedge until the two parties meet. If the line of fire is already of considerable length it is attacked simultaneously at different points and divided into sections, each of which is dealt with separately. Fire-fighting usually takes place at the hottest and driest time of the year, and has to be continued day and night: there are few if any more thirst-producing experiences, particularly under a tropical sun, and if water is not readily obtainable in the neighbourhood it is essential that each man should carry with him as large a supply as he can. More elaborate methods of extinguishing forest fires have been developed within recent years in North America, particularly in the use of canvas hose-pipes through which water is forced by means of portable motor driven power pumps. The railways are also equipped with tank cars from which water is pumped by steam through hose-pipes. There are obvious limitations to the use of such appliances for extinguishing forest fires, more particularly owing to the limited radius over which they can be operated: nevertheless it may be said that the development of mechanical equipment in fire-protective work is as yet in its infancy, and we may yet see great improvements in this direction.

If a fire has got out of control to the extent of rendering ordinary methods of extinguishing it impracticable, counterfiring may become necessary by which is meant the starting of a second fire in advance of the original one and guiding it so that it burns back towards the original one and extinguishes it. Counterfiring usually begins from a fireline, road, broad stream, or other suitable line, and is carried out with the help of a party sufficiently strong to prevent the fire from spreading in the wrong direction.

Even if a fire has been successfully extinguished for the time being, the danger is not necessarily over. Logs and stumps may continue to smoulder for days, and if, as in the case of tropical deciduous forests, fresh falls of dead leaves take place and the smouldering logs are fanned into flame by a strong breeze, a fresh fire may begin. Where such a danger is feared it is necessary to patrol the scene of the fire for a few days, smouldering logs and stumps being extinguished.

Operations subsequent to the occurrence of a fire consist of a careful inquiry into and a report on its origin, if discovered, its extent, the damage done, and other particulars; a map showing the tract burnt is a useful accompaniment to this report. Prosecutions may follow in the event of culpable offenders being traced. The burnt forests themselves may require early attention. Coniferous forests in particular, if the trees are weakened or killed by fire, are liable to infestations of bark beetles and other noxious insects, and the extraction and utilization of partly burnt material, so far as this is possible, is a matter of importance. In the case of young crops of hardwoods it may be advisable to cut back damaged saplings to ground level in order to promote a regrowth of new shoots from the base.

The results of fire-protective measures can best be recorded by means of fire maps. These are skeleton maps on which burnt areas are marked annually for a series of say 5 years, each year's area being shown by a distinctive pattern of cross-hatching. After each quinquennial period a new map is commenced, the old maps being preserved. Thus the location of fires each year since protective operations began may be seen at a glance. These fire maps are useful not only for indicating to what extent fires are successively diminishing or increasing, but also for showing in what parts of the forest fires are most liable to occur, information which may give a clue to their origin. In parts of North America and India these fire maps have shown conclusively that forest fires have originated most frequently in the neighbourhood of farms and village lands, a fact which indicates that more care on the part of dwellers near the forest would lead to a diminution in the number of fires.

In this paper an endeavour has been made to indicate some of the more salient points connected with forest fire-protection: the actual measures to be adopted in individual cases must depend on local conditions, which vary greatly in different regions.

Mr. J. E. Peat, Post-Graduate, left for England *via* Bermuda and New York by the S.S. *Chignecto* on the 27th June.

COLONIAL POLICY.

The "Sea-mind" and the "Land-mind."

PROF. L. C. A. KNOWLES, M.A., LL.M. (Cantab.), LITT.D. (Dublin), Dean of the Faculty of Economics in the University of London.

FEW people seem to realize how completely the English have had to change their attitude towards imperial problems within the last fifty years. Up to about 1870 Englishmen thought of lands beyond their island only in terms of the sea approach. Settlement was on the fringe of islands or continental coast lines, interiors were unexplored. Colonies were regulated by Navigation Acts because if the sea transport were regulated, colonial trade was automatically regulated also. Accessibility to the sea or to a navigable river leading to the sea were the things that mattered in the development of the Empire.

With the coming of railways which penetrated interiors and enabled great masses of foodstuffs to be moved from the centres of great continents, a gradual transformation took place in the way in which people thought about the economic development of new countries. They gradually began to think in new terms, in terms of land, not sea. The Indian government after the Mutiny was obliged to think in terms of railways in order to move troops quickly to keep or restore order or move food supplies to alleviate famines. The railways proved to be a great technical training ground for Indian peoples, introducing wage payments in money and a new standard of wants. Pilgrimages in India by excursion ticket with children at half price are now one of the most paying items of Indian railways. This means movement amongst a previously stationary people. This inland penetration accordingly brought up the new question of responsibility for native races. As long as nations only traded on a coast line they had no responsibility for native society which they did not affect in any way. As soon as they got inland and began to build railways then the impact of modern civilisation on primitive tribes began to be felt and the land attitude of mind could no longer confine itself merely to the conquering of distances and physical obstacles over large land areas. How to prevent exploitation and preserve what was best in native society while at the same time developing the resources of the country for the world was the new problem.

In the early days England thought if she stopped the slave trade on the high seas she had done her duty by native races. Very different was the question when she penetrated into countries like Northern Nigeria where slavery was part of the social system. It was not enough to free a man, he had to be trained to assist in the development of the country. Merely to free him was, so to say, to leave him in the air. A constructive policy was necessary. As soon as the European government began to own hinterlands land questions arose. To whom does the land belong? What rights in the land shall the dominant power recognize? How shall it deal with unoccupied land? How shall it improve the methods of cultivation? Again a new policy was needed. The land attitude of mind is therefore a new psychology, and nothing is more interesting than to see a people like the British, habituated to thinking in terms of sea problems, freights, the safety of ships, the abolition of scurvy, the transport of such commodities as will keep for a long period and will not heat or ferment when going through the Tropics on sailing ships—all these were the subjects with which the sea mind was preoccupied. The transition from the sailing ship to the steamship was accomplished with ease by a nation so deeply imbued with the sea mind and England still remained the carrier of the world. India was the first country in which the English had to adapt themselves to the new problems, created by an inland expansion. Africa was the next great step in the transition from the sea to the land mind.

The new report on the policy that should be pursued with regard to the British territories in East Africa brings out this new land attitude very clearly (1). In Kenya, Uganda, Tanganyika, Nyasaland and Northern Nigeria (now taken over from the South African Co.), there are an unusual number of difficult problems to be faced. In the first place Kenya was acquired by the Imperial British East Africa Company. Its first step was to try to stop the slave trade from the interior to the coast. The slaves were not merely valuable as labourers, they were valuable to carry ivory through the belt of the tsetse fly which destroyed draught animals. To destroy the slave trade was therefore to destroy trade in general since no other transport was available. A new trade had to be evolved and a new form of transport provided, the result of which was the Uganda railway. Indians came in to build the railway and work it, white men settled in the highlands and began to experiment with sisal, maize, coffee, and sugar as new cultures—they needed labour but some of the native tribes were cattle breeders and did no agricultural work, others did not want work being provided for by their reserves, others were taught to grow cotton which absorbed their energies without going out to work. In other words there was a labour shortage. A clash arose between the various interests in the Colony. The Indians (23,470) demanded the right to vote, the white people (10,293) were afraid of being snowed under. The Indians had other grievances in the proposed policy of segregation and the reservation of the highlands for the white man. The British government being appealed to laid down the rule that it was above all a trustee for the native African peoples and that their interests came first. A commission consisting of the Under Secretary for the Colonies and two other members of Parliament—one Labour and one Liberal—were sent out to see how this trust could best be exercised. In their report we get the definite principles of the new land attitude fully set out in 192 closely printed pages. First

(1) Cmd. 2387 (1925) 3/6.

and foremost, as might be expected, the commission emphasizes the overwhelming importance of railways and more railways. "Where there are railways to-day there is development. There is really no effective substitute for railways" (1) Cotton in the absence of railways can apparently only be moved profitably to-day for 60 miles and then only at present high prices. Tobacco and the higher priced coffees will stand transport for a longer distance but for the less highly priced crops the "commercial radius" is much less than 60 miles. The report summarizes by saying "In our opinion the further economic development of both native and non-native production in East Africa is dependent on the early provision of increased transport facilities and in particular on new railway construction." (2) The commissioners accordingly recommended the issue of a loan of 10 millions by the Imperial Government to be devoted to new railway building in East Africa. "To our mind the financing of transport facilities in East Africa not only is one of the finest possible investments for British trade but is a moral responsibility resting upon the Mother Country. The development of Africa's resources is needed by the trade of the world and it will be nothing short of a dereliction of duty if British initiative, both public and private, fails to rise to the height of its opportunity." (3) There speaks the land mind trying to force its point of view on the sea mind which thinks in terms of the open sea which needs no made road.

Next comes the question of Native Policy. "It is difficult to realise, without seeing Africa, what a tremendous impact is involved in the juxtaposition of white civilisation with its command over material force and its comparatively high and diversified social system, on the primitive people of Eastern Africa. The African native is confronted with a whole range of facts entirely beyond his present comprehension and finds himself caught in a maelstrom of economic and cultural progress which in the majority of cases baffles him completely." (4) There are two theories of the right way to deal with African natives—the contact theory and the control theory. According to the former the native learns best by being a labourer on the white man's land. The control theory practised successfully in West Africa, is that the native learns best by bringing pressure to bear through the chief whom the native is accustomed to obey, as the disruption of native society is less. The whole question of native production, labour supply, education and medical services are discussed in the report and the ramifications make one realise the responsibilities involved when a sea people take to being the paramount authority over continents.

Not the least interesting of the questions a land people have to face is that of insect pests. As long as Europeans confined their activities to the sea coast yellow fever and malaria were the great enemies. When, after 1897, it became known that these scourges were due to the mosquito, precautions were taken. But Africa has its own special scourge of insects in addition, and penetration brings the dominant power up against the tick and the tsetse fly. The tick is known to convey various cattle diseases with results that are fatal to both the animals and the transport in the shape of the trek ox. The tsetse has an even more evil record. It conveys the trypanosome which causes "nagana" which is fatal to animals except donkeys and wild game. It also conveys the sleeping sickness to man. (1) Now the tsetse fly cannot convey either of these diseases to a locomotive. Hence railways solve the transport problem! But the fly is spreading as it attaches itself to moving things and it is wiping out the cattle herds of the natives in many parts. This causes them to migrate leaving land uninhabited and also makes for their moral degeneration in many ways. The fly is now said to be spreading in all the territories dealt with in the report. "It is encroaching in North-Eastern Rhodesia to such an extent that the Abercora cattle district is now surrounded by infested areas. Monbera, the principal cattle area of Nyasaland has recently been similarly cut off from its markets and over a considerable part of Uganda it is impossible to keep cattle, so that hand-tilling in cultivation remains an imperative necessity." (1) This prevents ploughing and thorough cultivation and leads to under cultivation. The commissioners speak of the desolation of the fly districts. Passing from well populated productive non-fly areas to the flybelt "an extraordinary change is noticeable. Although the physical features and the climatic conditions appear to be similar in all respects, there are no signs either of cultivation or of cattle, or of population except for a few railway workers. The fly is responsible." The "belt of desolation" stretches approximately for 120 miles East and West from Kazi to Tabora. (2) A tsetse fly commission is now about to set out for Africa to see what can be done to fight the fly and to combat sleeping sickness by medical means. The shortage of labour is already acute in some of these territories and if labour is obtained for making the railways the planters may go short. The native population is apparently declining and medical knowledge which shall lessen the great infant mortality is necessary if the labour supply is to be adequate to the demands of the future development of East Africa. But the application of medical knowledge is difficult without educating the mothers first and so railways, education, labour supply, doctors, cotton-growing and tsetse flies are all inextricably intermixed. Even witch doctors have their uses. "The greatest curse to African society is usually the influence of the old women. They are often worse than the witch doctors as their influence is almost invariably most reactionary. It should be remembered that the idea of the witch doctors in the old Africa was to smell out witches and in fact kill off the old women and not a few of the old men." (3)

(1) p. 10. (2) p. 182. (3) p. 21. (4) p. 21.

(1) It caused the deaths of 300,000 natives about 20 years ago in Uganda, roughly $\frac{1}{10}$ of the population, p. 70. (2) p. 71. (3) p. 40.

Thus the new land policy has to take account of a far larger variety of interactions than the old sea and coast policy and the last half century has witnessed the necessity for educating an island race to think in terms of continents and the peoples that inhabit them. This has involved a new conception of statesmanship and responsibilities. It has called for the application and development of new branches of knowledge—scientific, economic, legal, and technical—to be used under wholly new conditions. It is the existence of these new conditions that has introduced the Imperial College of Tropical Agriculture which, proceeding like Great Britain herself from a small island is helping to transform the land areas of new continents with new cultures, better crops, efficient marketing, assistance to planters, and the training of native agriculturists.

THE COLLEGE SUGAR FACTORY.

PROF. O. F. BOYD, B.A.

THE Experimental factory succeeded in completing its first crop satisfactorily and successfully. The machinery ran smoothly and little difficulty was experienced. The canes from the Government Farm were ground and were of a very good purity, and sucrose content.

The principal type of sugar made was grey crystals, although a small amount of yellow crystals was made.

The following figures will give a fair idea of the work accomplished.

General Report.

EXPERIMENTAL SUGAR FACTORY, 1925 CROP.

No. of grinding days	74·
Tons of cane ground	2,606·382
Tons of sugar made	246·343
Bags of sugar made	1,962·
Tons of cane to one ton of sugar ..	10·5
Per cent. yield of sugar on cane ..	9·451
Average sucrose in cane per crop ..	12·688
Do. fibre do. ..	13·251
Do. crushing figure	74·661
Do. purity of the syrup ..	84·18
Do. do. final molasses. .	34·95
Do. do. normal juice ..	80·02
Pounds of lime per ton of cane ..	1·9
Pounds of sulphur per ton of cane ..	0·57
Gallons of fuel oil per ton of cane ..	7·29
Approximate gallons of Final molasses per ton of cane (including first molasses sent outside)	8·74

A deputation waited upon the Rt. Hon. L. S. Amery, Secretary of State for the Colonies, on July 7th, to urge the claims of the College. Cabled reports state that the reception was most favourable.

QUALITY OF CACAO.

By SIR FRANCIS WATTS, K.C.M.G., D.SC.
Principal Emeritus.

IN referring to the quality of cacao certain obvious defects, such as those arising from mouldiness, the attacks of insects, the presence of dirt or admixtures are readily appreciated, but there remain other important features which have a bearing on quality the nature of which is less tangible and the definition not easy.

In dealing with market samples of cacao consideration is given to other features which are related to the qualities which manufacturers regard as important; desirable features are plumpness of the beans, ready fracture or break, giving rise to friable "nibs," good colour of the interior of the bean, a cinnamon colour being preferred to purple or dark colours, pleasant taste and aroma and freedom from excessive bitterness. These characters are supposed to indicate that the beans have been properly fermented; proper fermentation having for its object the removal of unpleasant bitterness and the production of a good "break"; they also indicate a quality of bean which the manufacturer desires in order to produce cocoa or chocolate of good flavour and aroma.

It is conceivable that free exchange of information between the grower and the manufacturer on these points would lead to better understanding of the manufacturer's real requirements and the ability of the grower, who prepares the beans for market, to produce what the manufacturer most desires. It is evident that there are various forms of manufactured goods each requiring certain characters in the raw material for their production to best advantage; if the growers and manufacturers fully understand each others' requirements and limitations it is possible that cacao beans might be put on the market specially prepared for distinct uses, a course which appears preferable to the present one of leaving it to the broker and manufacturer to select from indiscriminate lots of cacao after arrival at European, American and other ports, produced without specific reference to manufacturers' needs.

It should be possible to modify the quality of the cacao by different methods of fermenting and drying and so, if sufficient information and knowledge were available, to meet manufacturers' requirements to some extent; on the other hand different varieties of cacao are recognised, each possessing distinctive characters; these are sought for by manufacturers for specific purposes.

Lowest in these varieties or grades is the so called Calabacillo, or Calabash cacao, whose beans are possessed of harsh, strong flavour and thus little suited for the manufacture of cocoa and chocolates of the finer grades and more delicate flavours. Next to this comes the Forastero, or "Foreign" cacao, as the word denotes: this cacao forms the bulk of the cacao coming to market here, it has a more delicate flavour and is

less bitter and harsh in taste than the Calabacillo, but still falls below the highest qualities or grades in this respect. The most delicate flavoured is the Criollo cacao, the native cacao of Venezuela and neighbouring parts of South America. This cacao produces large plump round beans and the interior of the beans is white.

These constitute the main divisions of commercial cacao, but they merge almost imperceptibly into each other so that various intermediate qualities and grades are recognised to which specific names are given. These cacaos are produced by varieties of the tree known botanically as *Theobroma Cacao*, Lin. There are, however, other species of Theobroma, from some of which are produced relatively small quantities of commercial cacao; these include *T. Mariae, T. microcarpa, T. pentagona, P. ovatifolia, P. speciosa* (Wild.), *T. subincana, T. bicolor, T. angustifolia, T. leiocarpa*, and possibly others.

One or two varieties of cacao deserve special mention on account of their possessing desirable qualities and, consequently commanding higher prices; of these, three varieties produced in Ecuador rank first amongst choice cacaos, these are the Arriba, Machala and Naranjal varieties which possess highly desirable and valued aromatic flavours in addition to being otherwise varieties of high quality; attention in Trinidad was directed to these varieties some years ago; while it was thought that it would be well if one or more of them could be introduced into the Colony no action was taken on account of the fear of introducing certain specific diseases of cacao which are known to occur in Ecuador.

Criollo cacao, the native cacao of Venezuela and the adjacent countries, constitutes the standard, choice, or high quality cacao on the market; the beans are plump and round and before fermentation and curing the interior of the beans is white; the flavour is delicate and free from bitterness or harshness. Unfortunately the tree is more delicate than either the Forastero or Calabacillo types, being very susceptible to the fungus giving rise to canker.

It has often been suggested that these varieties producing the more valuable kinds of cacao should be introduced into other cacao growing countries: this has been attempted on many occasions, but little or no success has resulted, for it has been found that plants raised from the seed of the imported trees failed to retain the original characters of these importations; steady deterioration took place, with reversion to the type of cacao growing in the country of importation. At first this reversion was regarded as of a mysterious nature, in some way connected with the climate or soil of the country into which it was desired to introduce the new variety; now however, it is well known that the apparent deterioration arises from cross pollination, so that the greater number of the seedlings derived from the imported variety, when produced in the vicinity of other cacao trees, are hybrids, and the seeds produced from these hybrids will be subject to still further crossing, so that in a few generations the imported type disappears.

This difficulty could be got over if it were possible to grow the imported trees, *e.g.*, the Criollos, or Arribas, at a sufficient distance from other cacao trees to prevent cross pollination. What that distance must be is, at present, not quite clear; for practical purposes it has been suggested that a mile would be sufficient. That being so, it would be quite possible to introduce the cultivation of Criollo cacao into Trinidad, for instance, if the newly imported plants and their descendents were grown in plantations not less than a mile away from plantations, or even isolated trees, of the ordinary types of cacao grown in the Colony.

There would be little difficulty in finding places where a few type specimens could be grown and maintained in a condition of purity, for there still remain in Trinidad places where a limited number of cacao trees could be grown a mile away from cacao trees of the ordinary type: on such sites it would be possible to raise seed and produce plants of pure Criollo parentage. This, however, would not of itself serve to ensure the production of Criollo cacao on plantations set out with these trees of pure parentage, unless these trees in turn were so situated as to be out of the reach of trees of the ordinary type and cross pollination not likely to take place. It is to be noted that even when borne on a tree of pure Criollo strain the seed, or beans will lose their Criollo character and have brown contents if they are cross pollinated by pollen from trees of Forastero or Calabacillo varieties, so that even with pure Criollo stocks it is not possible to produce pure Criollo cacao for market if other types of cacao are grown in the neighbourhood: this militates against the suggestion that plantations of Criollo might be developed by budding.

To establish plantations of Criollo cacao it would be necessary to proceed on what is known as a "community basis," as has been done in the case of growing pure strain cottons. On this basis, community action has to be taken to ensure that nothing but the pure strain desired, whether it be cotton or cacao, is grown in the district. It was the adoption of the community basis which rendered it possible to grow and to maintain and even to improve the Sea Island types of cotton introduced into such islands as Montserrat, St. Vincent, St. Kitts and others in the West Indies. Sea Island cotton was at one time grown on certain islands off the coast of Georgia in the United States; when seeds from the plants grown there were taken to the mainland or to countries where other types of cotton existed the crops of cotton grown from the seed raised in the new districts steadily deteriorated and recourse always had to be had to seed from the Sea Islands in order to maintain the character of the strain. At one time, as in the case of cacao, this was attributed to the influence of soil or climate; in the case of this cotton it was thought that it would not maintain its character if grown at any considerable distance from the sea. The fact is, the deterioration is due to cross pollination with other varieties of cotton and the consequent mixed character of the hybrids. That there was

some beneficial influence in the "Sea Islands" arose from the fact that they were islands and, consequently, it was possible to ensure the cultivation on them of one type of cotton and to exclude other forms, thus ensuring the absence of cross pollination.

It would probably be a matter of considerable advantage if plantations of pure Criollo cacao could be established in Trinidad; this would result in the production of high priced cacao, for which there appears to be a considerable demand. This demand is likely to be sustained and even to increase, for it is probable that supplies of pure Criollo cacao are diminishing on account of the introduction of Forastero and similar types of cacao into districts where pure Criollo cacao alone was formerly grown, so that the work of hybridisation has already set in: this is, perhaps the case in Ceylon, and it may have gone on to some extent in some of the regions in and around Venezuela where formerly nothing but Criollo cacao existed.

It should be a matter for consideration on the part of the cacao planters of Trinidad whether it is worth while to endeavour to establish in the Colony a district producing pure Criollo cacao so as to obtain the advantages which would arise from the cultivation and marketing of this desired strain, whose production may be diminishing, but for which the demand is likely to be increasing.

If such a movement is thought to be desirable it would have to be undertaken on a community basis; a definite area would have to be chosen for the work and this area would have to be sufficiently far away at all points from cacao trees of other types, and on the area itself not a single cacao tree of any other type than Criollo could be allowed to exist.

It is evident that in order to attain this it would be necessary to have legislative action so as to make it possible to prevent the planting of any other type than Criollo within the selected district and to permit of the destruction of trees of any other type, if they previously existed there.

It might be difficult to confer the right to exercise such action on any individual planter, or group of planters; such action should have a community basis. It may be suggested that action of this kind might well be taken in Trinidad by the Co-operative Society of Cocoa Producers of Trinidad and Tobago, now in process of formation, which has for its object, by working in association of kindred Societies in other countries, the taking of steps for the benefit of the cacao and cocoa industries throughout the world and in which it is hoped to ensure the participation of every cacao grower in the Colony.* When sufficiently established it should be possible for this Society in the common interest of all its members, in other words, in the interest of every cacao grower in the Colony, to establish plantations of pure types of cacao, of which Criollo has been principally referred to, but the idea may be also applied to other varieties, such as the Arriba and Machala which have been mentioned.

* See *Tropical Agriculture* Vol. II p. 134.

EAST AFRICAN DEVELOPMENT.

H. MARTIN LEAKE, M.A., D.SC., F.L.S.

THE appearance of the report* of the Committee appointed by the Secretary for the Colonies in the late Labour Government marks a definite stage in the development of those Territories. The document is comprehensive and of the utmost importance. It details admirably the conditions and the problems and it admirably crystallises in a series of recommendations the requirements for progress. The territories are without doubt a vast source of real wealth but a source which must be tapped with discretion if the spring is not to be drained dry. Clearly the wealth must remain potential unless it can be brought to a market and for this transport and communications are requisite. That, however, is not all; the export of produce in large quantity leads, in the result, to the import of an equivalent amount of goods. But the nature of those imports may be of very different value to the country and the community. It is axiomatic that increase in material wealth must proceed *pari passu* with progress mental and moral if a community is to remain healthy and there is a real danger that progress of the former kind may be too fast. The ill educated native having few wants, either ceases to produce and becomes idle or falls a ready prey to any none too scrupulous trader; he is soon relieved of the wealth which he has earned and this wealth is then of little use to the Country. A labour condition is thus produced which is similar to that developed from the trucking system in the early days of the industrial development. At the same time there is an urgent need for the wherewithal to finance such projects as roads and rails for the further opening up of the country and the development of its material resources. During this stage there appears no objection, moral or material, to the imposition of a tax, based on a sliding scale, which would protect the natives from excessive price fluctuations, give him a reasonable return for his labour and divert the enormous profits, realised and squandered in times of high prices, to Government for development.

The history of the development of East Africa in recent years is a romance. Penetration by missionaries has been followed by an influx of traders and a Governmental organisation has grown up in the course of this rapid development. There is a tendency to forget, even in the short space of two generations, the welter of strife that proceeded the peace and order which has now been realised. Recognition of the position of trusteeship for the indigenous population can be pressed too far. There is also a trusteeship for humanity at large to develop and place at the disposal of that humanity the vast economic resources. There is a moral obligation to those who, with courage and enterprise, have made the continent the sphere of their life's work. And in an agricultural community the crux of the problem

* Report of the East Africa Commission Cmd. 2387, 1925. Price 3/6.

must lie in the land and its ownership. Here there is urgent need for a settled policy. Land is limited and a population in most cases increasing; the problem of land tenure is consequently not static. There can be little doubt that policy has been inconsistent, at times too favourable to the settler at others too favourable to the native. Communications, education and medical services are urgently needed but are costly; their provision is only possible as and when the economic advance in production and the earning capacity of the native increase. Such development requires capital and capital will not be forthcoming without guarantees. It is quite possible to give these guarantees in land without depriving the indigenous population entirely of their status of landholders. A vacillating policy has here thrown open the land to speculation, there it has interposed too rigidly and the uncertainty in this respect is held by the Commission to be the principal cause of disquiet among the natives.

Two factors tend to render the labour question acute. In his primitive state the labourer requires but little; he can with small effort raise the wherewithal to supply that little and he sees no reason for doing more. Again labour is on the whole deficient, the rapid development of public services and works tend to draw labour away from the land and the reserves. There exists a competition for labour. The first step is to replace the system, which arose out of the time when the men were mainly engaged in fighting and the women consequently worked. The pax Brittanica has removed the man's first function and he must learn to substitute another function for that which he has lost. A revolution similar to the break up of the feudal system is now in process. Under the circumstances compulsion is legitimate for the fulfilment of the duty owed to humanity provided the principle is not applied for private profit.

And this leads up to the foundation of the whole question, the education. Education alone will stimulate the desires the means to purchase which are only secured by labour. But it is necessary to discriminate between education of the individual and education of the community in a whole. That progress mental and moral must proceed *pari passu* with the increase of material wealth is as true an axiom as the converse proposition and in a country whose wealth is agricultural in origin education of the individual must be based on agriculture. The pressure to a literary education; the compelling force for which is a demand for efficiency in the subordinate administrative services, must be opposed. Education of the community is a different matter. The indigenous organisation is tribal and this latter class of education implies an education of the chiefs to undertake their responsibilities. Evolution of the tribe can take two directions, the chief may be absorbed into the governmental system or he may become in some measure a landlord. The tendency is towards the former function. But whichever be becomes, and this time alone will solve, he has a rôle to play and the question of his education is apart from that of the members of the tribe. Education on these lines would tend to re-establish the tribal system which in recent years has been materially undermined. It is doubtful if the reports grasps in full measure this all important point but there can be no doubt that if the fact is not grasped education will fail lamentably to produce the effect that is desired by all.

THE COLLEGE.

DR. H. MARTIN LEAKE, M.A., F.L.S., Principal of The Imperial College of Tropical Agriculture, addressed the Annual Meeting of the Members of the Liverpool Chamber of Commerce at Liverpool Town Hall, on May 19th. The Lord Mayor of Liverpool was in the Chair, and Mr. J. Sandeman Allen, M.P., Chairman of the Chamber, through whose courtesy Dr. Leake had been given the opportunity of speaking at the meeting, delivered a forceful speech in which he laid stress on the value of the tropics to the British Empire. In this connection he mentioned the fact that an Exhibition of Tropical Agriculture was to be held in Liverpool in the Autumn.

Dr. Leake, after explaining the objects and aims of The Imperial College, referred to the fact that it had been argued that the site was unsuitable. He himself had been inclined at one time to hold this view, but since he had been to Trinidad and had seen the local conditions, he could candidly say that though he knew India and Ceylon, and had been through large portions of Africa both North and South, he could think of no place which possessed so many advantages. One of its chief assets was the plantation system which was so well represented within a small area. The site of the College—a free one thanks to the generosity of the Trinidad Government—was situated in a tract on which practically every tropical crop, including cotton of all types, could be grown to perfection.

Dr. Leake then made sympathetic reference to Lord Milner's death, and mentioned the great work the late statesman had performed in connection with the Special Appeal for the College, a work which was now being carried on by Lord Burnham. In connection with this Special Appeal for Funds, he stated that there were at least three things required which were essential for the development of the College. At the present moment there was nowhere to house more students if they wished to come for training. There were at present 33 students and accommodation could barely be found for this number. The second essential requirement was an estate on which the business side of Agriculture could be thoroughly studied by the students. The third item arose from the most generous gift of a Chair of Tropical Hygiene and Sanitation which had been made to the College by the International Health Board. The gift was for five years, and funds were needed to provide the essential requirements in connection with this department of the College. The importance of this aspect and the need that students should have the knowledge of such matters when they go to tropical countries required no emphasis.

TROPICAL WORLD NOTES.

Dominican Republic.

During last year there was a marked increase in the total exports of the principal agricultural products of the Dominican Republic, the value of which exceeded thirty million dollars. Shipments of sugar rose from 169,500,000 kilos. in 1923 to no less than 220,600,000 kilos., and there was an increase of well over three million kilos. in exports of cacao, which totalled 23,142,498 kilos. Coffee exports jumped from 1,397,878 kilos. to 2,232,593 kilos., and corn shipments more than doubled at 8,894,545 kilos. The other prominent export product was leaf tobacco, which, although advancing in value, declined in quantity from 16,318,536 kilos. to 15,760,205 kilos. The importance of these five products in the economic life of the Dominican Republic is emphasized when it is realised that of the total exports last year they accounted for over 93 per cent.—*Chamber of Commerce Journal.*

Sierra Leone.

For some years up to 1907, the British Cotton Growing Association conducted experiments in the Moyamba District of Sierra Leone with the object of inducing the natives to cultivate cotton for export. Whilst these efforts did not prove successful, several of the reports on the indigenous "quande" cotton were by no means unfavourable; the experiments were made in areas which were found to be unsuitable, and at a time when the price of cotton was so low that it was impossible to induce producers to grow the raw material in sufficiently large quantities. The Government have now carried out further experiments in the Hinterland, and five tons of long-stapled American seed were imported from the Association's ginnery at Zaria. Some 270 acres have been planted under the supervision of Inspectors, and it is estimated that a much larger area has been planted by the Chiefs and people independently, and there is also an increased acreage under indigenous cotton. In order to assist the Government in their efforts, the Association have supplied them with a complete ginning plant and shed, and provided an engineer to supervise the erection at Boia and start the plant working, and arrangements have been made for the purchase of the crop on account of the Association.

The latest reports indicate that, whilst the crop of improved long-stapled cotton has suffered severely this season from excessive and prolonged rains, the Government Agricultural Authorities have no doubt that cotton can grow well in the Colony. Greater efforts are being made for next season, and, although the returns for the first year's working will be small, it is hoped to create a big industry in the future. If Sierra Leone, with its obvious advantage of comparative contiguity to Lancashire, can be provided to be capable of growing suitable cotton, a new era of prosperity may well be in sight.—(*Annual Report of the British Cotton Growing Association for* 1924.)

Java.

In the May issue of the *Louisiana Planter and Sugar Manufacturer* an account is given of the statistics for the sugar crop issued by Messrs. Gijselman & Steup of Sourabaya, Java in March, 1925.

From these statistics we learn that during the crop of 1924 there was a total of 180 mills grinding in Java, of which 95 manufactured Superior Headsugar and 85 Headsugar and Muscovados. The total production of Superior Headsugar was 17,483,999 piculs (1 picul=136 pounds). The production of Headsugar and Muscovados was 14,954,093 piculs. The number of mills that will grind the 1925 crop are reported as 179, of which 96 will make Superior Headsugar and 83 Headsugar and Muscovados. The production of sugar in Java has increased from 12,340,377 piculs in 1900 to 32,437,092 piculs in 1924.

Sudan.

The total shipments of cotton by the Sudan Plantations Syndicate Limited came to 17,679 bales, which compares with 12,266 bales for the previous year. In the Gezira the crop suffered from "Black Arm" which is a bacterial disease, and from Thrips which is an insect pest, for neither of which has any effective remedy yet been found. The area under cotton in the Gezira was about 20,000 feddans, but for the reasons stated the crop from all stations has not been good, and the final yield was just under three kantars per feddan.

Wonderful progress has been made by Messrs. S. Pearson & Son Ltd., in the construction of the Makwar Dam and by July (1925) the Sudan Plantations Syndicate Ltd., hoped to have a considerable area ready for cultivation. By 1926-27 it is anticipated that 100,000 acres will be under cultivation in the Gezira.

The Report of the Commission, consisting of Sir John Russell of Rothamstead and Dr. Martin Leake (now Principal of this College), has been adopted in most of its recommendations.

The Kassala Railway was opened in April and links Kassala with the Red Sea and the Khartoum main line, serving the area now being developed by the Kassala Cotton Co., Ltd., where 10,000 feddans are under cotton this year, and where it is hoped that eventually 100,000 acres will be developed by irrigation.

There has been a large increase in rain-grown cotton in the Blue Nile Province and Fung, and with reasonable prices further developments are anticipated. Large tracts in the Nube Mountain Province possess good cotton soil and ideal climatic conditions but the lack of adequate transport facilities hinders development.

The total crop estimated for 1924-25 for the Sudan is 35,600 bales of Sakellarides cotton and 19,700 bales of American cotton, making a total of 53,300 bales. There has been an inadequate flood at Tokar, where the crop shows a substantial reduction on the previous year, otherwise the results would have been even better.—(*Annual Report of the British Cotton Growing Association for* 1924.)

Porto Rico.

Mr. W. F. Callander, Chairman of the Federal Crop Reporting Board, reports that there is little likelihood of any material increase in the acreage devoted to sugar-cane in Porto Rico. Practically all the land suitable for growing cane is now planted to this crop. It is possible that some of the land, especially in the drier sections, may be planted to Sea Island cotton. Production costs for sugar are considerably higher in Porto Rico than in Cuba because of the necessity of using fertilizers extensively, and the greater expenses of cultivation. The total output of sugar for the year is likely to run considerably above previous estimates. Many new varieties of cane are being tried out in Porto Rico with considerable success. Several varieties with a much higher sugar content and giving better than ordinary yields have been found and are being disseminated. Only three to five crops are secured from one planting of cane, which is much fewer than is the case in the heavy producing sections of Cuba.—(*Planter and Sugar Manufacturer.*)

Kenya Colony.

Cotton growing is still in its infancy in the Colony, and, although a number of experiments have been carried out, cotton is only one of several crops which can be grown there profitably, and for the most part it would appear that the populous areas are rather too cold for successful cotton cultivation. The British Cotton Growing Association have established ginneries at Asembo and at Malikisi, and in the latter district there is every reason to believe that the operations will prove successful, and it is anticipated that the production in the 1924-25 season will be 500 tons. Railway extensions which are now being made are expected to give a great stimulus to cotton cultivation in this area. In the Kavirondo Province very little progress has been shown, except in North Kavirondo, owing largely to climatic conditions. Both Central and South Kavirondo appear to be in a region subject to drought, and disappointing from a cotton-growing standpoint.

It must be remembered that conditions in Kenya are very different to those which obtain in other parts of East Africa, as it is the only country on the Equator where there exists a progressive European community. The most important crop is Maize, which gives exceptionally good results ; Coffee and Wheat are also important European industries, and attention is now being given to Tea planting. Recently there has been a notable increase in the native productions of Maize, Simsim and Cotton, and the Government are assisting and stimulating this native development. The 1923 returns show a Kenya Cotton export of 129 bales, but the actual crop is larger as some of it was sold to Uganda ginners over the border. The crop for 1924 is 1,320 bales, which can only be considered as disappointing as it was expected that at least 40,000 acres would be planted under cotton. —(*Annual Report of the British Cotton Growing Association for* 1924.)

Cuba.

General Gerardo Machado of Morales was inaugurated as the fifth president of the Republic of Cuba on May 20th, having been elected by an overwhelmingly large majority. He is closely identified with Cuba's principal industry, the production of sugar, and his familiarity with the agricultural resources and problems of Cuba render his elevation to the presidency of particular importance, and of great promise to the republic *The Planter and Sugar Manufacturer* reports that since his election to the Presidency, General Machado visited the United States and on this visit stated that it was his intention to give every possible facility to the expansion of the commercial relations between Cuba and the United States. Relative to Cuba's sugar industry, General Machado stated that the belief that Cuba's sugar production may still further increase, is an error. Cuba has attained almost its maximum production in the crop now being harvested. He states that all the lands of Cuba are not economically suited to the cultivation of sugar-cane, and further that many lands already under cultivation are in a state of exhaustion for the further growing of cane, and it will be necessary to devote them to other crops. Cuba's sugar industry has developed rapidly in recent years and the present crop is now estimated by prominent authorities at approximately 5,000,000 tons the largest crop in its history.

West Indies.

Some 5,000 bales per annum of the finest cotton are being produced, and this quantity could be greatly increased with a better demand for the product. Not only has the curtailment in the demand for luxury articles adversely affected the sale of fine cotton to Lancashire spinners, but the French Exchange has been unfavourable to purchases by French spinners. The position of Sea Island cotton has been greatly improved by the high prices which have recently been ruling for the best quality of Sakellarides cotton, and the immediate outlook is more promising than at any time since the depression in the cotton trade set in some four years ago, although the demand for this type of cotton is still limited.

In St. Vincent, Montserrat and Nevis, the cultivation of Sea Island cotton is of primary importance, and is a valuable subsidiary industry in St. Kitts, Antigua, Barbados and the Virgin Islands. With the advent of the Mexican Boll Weevil in the United States, the cultivation there of the best type of this cotton has become unprofitable, and production is now almost exclusively confined to the West Indian Islands.

In August the Islands of Montserrat, Nevis and St. Kitts were overtaken by a very disastrous hurricane, and the Association made a donation of £500 towards the relief of suffering. This donation was paid over by the Colonial Office to the Mansion House Relief Fund which was afterwards opened.—(*Annual Report of the British Cotton Growing Association for* 1924.)

Uganda.

The cotton industry in this country has increased beyond all expectations, indeed the growth has been so rapid that it has led to some dislocation of the local economic conditions. The labour position on the railway and at the ginneries is becoming serious. While the country can, perhaps, be best developed by the natives on their own land, there are certain features of the economic organisation of the country apart from agriculture creating a demand for labour which it is essential should be met.

The exports of cotton from Mombasa during 1924 were 51,441,657 lb. of lint (or 128,604 bales of 400 lb. each) valued at £3,486,565. For the previous season the crop amounted to about 93,000 bales. The Government has intimated that free competition will be permitted in the purchase of seed cotton and that the Government will not interfere in regulating prices, but close control of the industry will be maintained in the interests of all concerned. A Cotton Control Board is to be set up for the purposes of selecting central markets, the consideration of applications for the erection of ginneries and generally advising the Government in all matters connected with the cotton industry. At present a tax of 6 cents per lb. of lint is imposed and with existing prices this does not press heavily upon the industry but in the event of a fall in prices the position would immediately be reconsidered.

Grading is not compulsory though native growers are strongly advised to practise it. To prevent the planting of undesirable strains the sale of seeds for planting purposes is prohibited, the collection and distribution being entirely in the hands of the Government. The Empire Cotton Growing Corporation has presented 300 ploughs for demonstration purposes and it is anticipated that with the extension of ploughing and other mechanical labour-saving devices, coupled with resaonable prices, the production should soon amount to 250,000 bales.

Considerable difficulties have been experienced in transporting the crop and strenuous efforts are being made to develop the existing means in order to cope with the increasing crops. Owing to the large number of motor vehicles available, and the excellent roads the transport of cotton to the railway system is very efficient. Considerable delay and consequent damage to crops is experienced on the railways. To reduce the congestion, no unginned cotton is allowed on Lake Victoria, limitations have been imposed on Lake Kioga and ultimately it is expected that the transit of all unginned cotton will be prohibited through Namasagali, thus relieving the congestion there.

The increase in the area planted in cotton during 1924-25 amounted to 30-50 per cent.; climatic conditions have been perfect and the new crop is estimated at from 180,000 to 200,000 bales.—(*Annual Report of the British Cotton Growing Association for* 1924.)

Nyasaland.

A record native crop of cotton was produced during 1924, which was all purchased by the British Cotton Growing Association on joint account with the Nyasaland Government at prices arranged beforehand between the Department of Agriculture and the Association. The natives were highly satisfied with the prices which they received, and as similar buying prices have been guaranteed for the 1925 crop, the native industry is making substantial progress. The districts which have given the best results are Port Herald, Balakas and Fort Johnston; the bulk of the native grown cotton is still produced in the first district, but Fort Johnston with encouragement should do equally as well. The number of markets held this season was 17, and it is proposed to hold 25 during the coming season, 7 of which will be in new districts in which the results for 1924 justify optimism regarding the future. With more favourable climatic conditions the past season's results would have been even better, for whilst the rainfall was sufficient, the growing districts suffered from cold misty weather during the ripening period and the crops suffered badly from boll rot. With the exception of trouble from rats and field mice, the damage caused by pests was much less than in recent years, which may be due to the enforcement of the "Cotton Pests Act" under which Ordinance all the old cotton bushes have to be uprooted and burnt by the middle of December in each year. There is still room for improvement in the quality of Nyasaland cotton, both that grown on European plantations and native grown, and the yield per acre is rather low.

The great bulk of the Nyasaland cotton crop is still produced on plantations owned by Europeans, with hired native labour working under white supervision, but it is in the direction of the native industry that extensions are anticipated. The prospects for the future are distinctly bright, large acreages have been cleared by natives to plant cotton this coming season, and it is hoped to double the native production to 5,000 bales in 1925. The working of the Cotton Buying Agreement has resulted in renewed interest and a real revival in native cotton growing, which will be permanently established under the system of guaranteed prices.—(*Annual Report of the British Cotton Growing Association for* 1924.)

WE understand that after prolonged discussions and negotiations both in the United Kingdom and in America, agreement has now been reached on the question of universal standards for American cotton. Modifications have been made which have satisfied both the Liverpool Cotton Association and the Federation of Master Cotton Spinners' Associations, and they have now withdrawn their opposition. The parties concerned are to be congratulated on having solved this vexed question by round-table negotiation.

THE ISOELECTRIC THEORY.

Its Application to Certain Problems of Crop Products Manufacture, and Soil Fertility

By PROF. F. HARDY, M.A.

[*The following article, which is to appear in six successive issues of this Journal, is an attempt to apply a modern theory of colloidal behaviour, based on the conception of the isoelectric point, to some tropical agricultural problems. Its main object is to stress the fact that certain great biochemical principles underlie many apparently diverse processes connected with crop production, and that an appreciation of these principles furnishes a stimulating aid to better understanding and to further progress. The Isoelectric Theory of Colloidal Behaviour is nowadays receiving close attention from scientific workers in many fields, and already its application has helped to solve numerous problems that have heretofore baffled investigators, in that it has replaced empiricism by scientific orderliness. It must be admitted, however, that the Theory presents some serious difficulties and limitations, and that it is by no means a final statement of truth. This should be borne in mind during the reading of the following accounts, for, throughout, the Theory has been used somewhat speculatively, and mainly as a suggestive working hypothesis, with a purposeful avoidance of academic discussion of certain of its debatable features.*]

CONTENTS:

I.—Statement and Explanation of the Isoelectric Theory.

1. The isoelectric point of proteins.
2. Precipitation of proteins by electrolytes.
3. The effect of hydration on colloidal reactions.

II.—Application of the Isoelectric Theory to Tropical Agriculture.

(*a*) *The Manufacture of Certain Crop Products.*

1. The coagulation of rubber latex.
2. The defecation of sugar-cane juice.
3. The fermentation of cacao.
4. Diffusion processes.

(*b*) *Reactions in Colloidal Soils.*

1. Improvement of physical texture by flocculation.
2. Soil Fertility and the effects of fertilizers.

PART I.

I.—STATEMENT AND EXPLANATION OF THE ISOELECTRIC THEORY.

1.—*The Isoelectric Point of Proteins.*

THE conception of the isoelectric point is due to W. B. Hardy (1899), of the University of Cambridge, who observed the remarkable behaviour of boiled egg-white protein suspended in water through which an electric current was passed (1). He found that the direction of movement of the egg-white particles under the influence of the electric current could be controlled merely by adding alkali or acid to the liquid. When the reaction of the liquid was alkaline, the protein particles migrated to the positive electrode, and therefore must have carried electronegative charges; when the reaction of the liquid was acid, they moved towards the negative pole, indicating that their charges then had positive sign. Very small degrees of alkalinity or of acidity were found to be sufficient to produce these results. When the reaction of the liquid approximated to neutrality, the protein particles remained stationary. At this point, the particles therefore could have possessed no resultant charge, neither negative nor positive, so that their condition was *isoelectric*. These observations with egg-white have since been reproduced for many other proteins.

The electrical behaviour of proteins, however, is not in itself of such great interest as the changes in properties that occur when proteins are brought into the isoelectric condition. Many of the properties of proteins dispersed in water, depend on the degree of hydration of the particles, that is, on the intimacy of their relationship or association with water molecules. It has been amply demonstrated that the degree of hydration of certain proteins tends towards a minimum as the isoelectric point is approached, whether from the alkaline or from the acid side. Thus, at the isoelectric point, suspensions of these proteins exhibit least viscosity, and possess least stability. Frequently, they are spontaneously precipitated when brought into the isoelectric condition, or they may easily be precipitated at this point by heating, or by adding alcohol, which aids in effecting further dehydration.

Following Hardy's discovery, attempts were made to explain the action of alkaline and acidic environments on the electrical properties of proteins. One of the early theories postulated a surface attraction or "adsorption" by the colloidal particles of electronegative hydroxyl-ions, derived from added alkali, or of electropositive hydrogen-ions, derived from acid. The adsorbed ions were supposed to give up their electric charges to the colloid, which thereby became negatively charged in an alkaline medium, and positively charged in an acid medium. In 1904, Jacques Loeb, of the University of California, offered a different explanation of a purely chemical kind (2). He stressed the fact that proteins themselves can act either as acids or as bases, depending on circumstances. When they act as acids, it is their carboxyl radicles that are reactive; when as bases, their amino radicles are brought into operation. Thus casein (the protein of milk) forms sodium caseinate when caustic soda is added to it, and casein chloride when treated with hydrochloric acid. In the first instance, the protein behaves as an acid

towards caustic soda, and in the second instance, as a base towards hydrochloric acid. Proteins are therefore called amphoteric electrolytes, or ampholytes. According to this view, then, protein particles placed in media of alkaline reaction, spontaneously dissociate into electro-negative protein anions (capable of combining with metal kations, such as sodium-ion), and, in acid media, into electropositive protein kations (capable of combining with acidic anions, such as chloride ion). The electric charges on the dissociated protein ions are therefore similar in origin to those that characterize dissociated electrolytes in general, but the ions of proteins are made up of aggregates of molecules, of which perhaps only those at the surface of contact with the liquid, are dissociated. Such ions are known as colloidal ions, and are of relatively large size and mass.

When precise methods of measuring degrees of alkalinity and of acidity were elaborated by physical chemists, and were applied to the study of proteins, it was found that the isoelectric points of different proteins do not always coincide with the position of exact neutrality. On the pH scale of Sorensen, exact neutrality is expressed by pH 7·0, which is the pH value of pure water. Alkaline media possess pH values *greater than* 7·0, and acid media, values *less than* 7·0.

The following figures give approximate pH values of the isoelectric points for some common proteins.

Animal proteins.

Albumin	(fresh egg)	pH 4·8	Average about pH 4·8
Denatured albumin	(boiled egg)	pH 5·5	
Casein	(milk)	pH 4·6	
Gelatin	(collagen of tendons, &c.)	pH 4·7	
Globulin	(blood serum)	pH 5·4	
Fibrin	(blood)	pH 4·8	
Nucleo protein	(prancreas)	pH 3·5	

Plant proteins.

Legumin	(peas, beans)	pH 4·5	Average about pH 4·5
Gliadin	(wheat)	pH 5·2	
Glutenin	(wheat)	pH 4·4	
Tuberin	(potato)	pH 4·4	
Vicilin	(beans)	pH 3·4	

It will be noticed that the isoelectric points of proteins generally lie on the acid side of the exact neutral point, so that, when placed in pure water (pH 7·0), proteins usually exhibit the chemical properties of weak acids.

2.—Precipitation of Proteins by Certain Ions.

An important outcome of the isoelectric theory of colloidal behaviour in proteins is the simple explanation it offers for interactions that occur when certain salts are added to protein suspensions at different pH values. Consider first the case of casein suspended in water rendered alkaline by the addition of a little caustic soda, and then treated with a solution of calcium chloride in considerable excess. Casein occurs initially in the alkaline solution largely as colloidal particles behaving as anions, and therefore forming with the sodium-ions, more or less soluble sodium caseinate complexes. The sodium-ions are doubtless attached at the surface of the colloidal anions by valency forces which we need not here further discuss. Calcium-ions in large excess (derived from the added calcium chloride), when introduced into the system, at once tend to exchange places with the sodium-ions, but the resulting calcium caseinate, unlike sodium caseinate, is insoluble, so that a flocculent precipitate is produced. The *degree* of precipitation will depend largely on the extent to which the calcium-ions "swamp" the system, and replace the sodium-ions, but the *nature* of the precipitate, with respects to its bulkiness, will largely depend on the alkalinity of the medium, because, within certain limits, the higher the alkalinity, the greater the hydration (and consequently the volume) of the initial protein anions. This example illustrates the defecating action of *lime* on certain plant saps containing protein (such as sugar-cane juice), in which it produces insoluble colloidal calcium complexes whose degree of flocculence, as is well known, depends chiefly on alkalinity. The action of lime (calcium hydroxide), however, in a sense is more direct than that of caustic soda *plus* calcium chloride, because lime is not only itself an alkali, but it is also capable of generating a relatively high concentration of calcium-ion, and therefore serves a dual purpose in the precipitating process.

Opposed to the effect of salts on alkaline protein systems, we have, secondly, the effect of salts on proteins in media on the *acid* side of their isoelectric points. Consider again casein suspended in water, but suppose that, instead of alkali, a little hydrochloric acid be added, and that, instead of calcium chloride, sodium sulphate be introduced into the system. Initially, the casein occurs here as a more or less soluble casein chloride complex. The subsequent addition of excess of sulphate-ions now tends to produce casein sulphate, which, unlike the chloride, is nearly insoluble in water, so that, in this case also, precipitation must follow. The end result is the same, namely the protein is precipitated, but the means to the end though strictly analogous, are opposite, in that, in the first case, precipitation occurs in an alkaline medium, and is effected by metallic (calcium) ions, whereas, in the second case it occurs in an acid medium, and is effected by acidic (sulphate) ions.

The questions might now be asked; (1) why does calcium-ion displace sodium-ion, and sulphate-ion displace chloride-ion in colloidal chemical combination? (2) What would happen if we added, instead of a single salt, a mixture of salts giving ions of various sorts; and (3) What causes certain colloidal compounds to be soluble and others to be insoluble in water?

To formulate satisfactory answers to these questions, certain fundamental ideas of chemical

combination must be considered, namely chemical affinity between ions, equilibria in reactive systems, the effect of hydration of ions, and the meaning of solubility. Speaking generally, ions differ in chemical affinity or *reactivity*, so that a more reactive ion may replace a less reactive ion from combination, even if the seat of combination be the surface of a colloidal ionic particle. The following list indicates the order of decreasing activity of certain common simple ions. Potassium, sodium, calcium, magnesium, aluminium, manganese, iron, hydrogen (all electropositive ions); hydroxyl (OH), silicate (SiO_3), phosphate (PO_4), sulphate (SO_4), chloride, nitrate (all electronegative ions, arranged in order of increasing electro-negativeness). When several simple ions are presented at the surface of a reactive colloidal ion, competition for place occurs, but affinity is not the only factor that decides which simple ions shall become attached; the relative *concentrations* of the different ions must obviously also be taken into account, for, if the concentration be excessive for one particular ion, a "swamping" effect may be manifest, and this may even outweigh a relatively low affinity and cause one ion to become attached in preference to another. Furthermore, the *degree of hydration* of the simple ions, and of the colloidal ionic particles concerned in a reaction, appears to play a particularly important rôle in deciding, not only specific combination, but also the *solubility* of the resulting compound or complex. This question is worthy of separate consideration at this juncture.

3.—*The Effect of Hydration on Colloidal Reactions.*

It is well known that different kinds of proteins (and other hydrophilous colloids, such as pentosans, pectins, higher fatty acids, and hydrous metallic oxides as well), exhibit different degrees of attraction for water, that is, different degrees of hydrophily. Thus casein and fibrin do not take up much liquid when placed in pure water, whereas gelatin and natural albumin are highly absorptive, swelling greatly, and finally going into a sort of solution (the "sol" state) in the liquid. Such highly hydrophilous proteins are stable even in neutral solution. Although they may exhibit isoelectric points, highly hydrophilous proteins appear not to respond markedly to the directing influence of an electric current. When treated with salts, in attempts to effect precipitation, they require relatively *very high concentrations* of ions before the separation of insoluble matter occurs (3). Finally, the order of precipitating power of simple ions that are capable of effecting such separation, is not necessarily the same as the order of their chemical affinity, but depends rather on the relative powers of the simple ions to attract water, that is, to effect dehydration of the colloid to a degree requisite for precipitation from unstable solution (4). The fact that simple ions are capable of combining in some way with water molecules, and are able, in consequence, to effect dehydration of hydrous colloids, is not always sufficiently stressed in discussions of colloidal phenomena. It is nevertheless susceptible of demonstration, and may indeed furnish an explanation of the so-called lyotropic or Hofmeister series, which were long ago formulated as a result of empirical observations on the relative precipitating powers of ions for certain highly hyphilous colloids.

The following is a typical lyotropic series for electro-negative hydrous albumin; the simple ions are therein arranged in order of decreasing precipitating power. (*a*) Lithium, sodium, potassium (? calcium); (*b*) citrate, sulphate, acetate, chloride, nitrate, thio-cyanate. The order in which simple ions are arranged in lyotropic series, agrees reasonably well with the order of their attracting powers for water, so far as these are known, but, unfortunately, experimental methods for determining the water-attracting powers of ions are fraught with so many fundamental difficulties, that precise measurements are not yet forthcoming, excepting in a few cases.

The whole subject of hydration of matter, whether it be colloidal, molecular or ionic matter, is not only intimately bound up with colloidal behaviour, but also with the question of solubility of matter in water. In general, soluble matter may perhaps be regarded as matter which enters into intimate relationship with water molecules, and insoluble matter, that which exhibits no such propensity. According to this simple view, the effective precipitation of hydrophilous colloids by added simple ions, is therefore decided by the ability of the simple ion either to cut off the colloid from close association with water in the case of *lightly* hydrated colloids, or to reduce the degree of hydration in the case of *heavily* hydrated colloids, by abstracting water from them. In the first case, the precipitation process is essentially similar to that which occurs in many simple electrolytic interactions, whereas in the second case, the process is quite different, being the result of actual water abstraction. Between these two extremes, intermediate cases doubtless exist. A recognition of these facts will enable one to correlate certain phenomena that at first sight appear incompatible, as a study of the specific examples next to be described should clearly show.

(*To be continued.*).

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(3) Pauli, "*Colloid Chemistry of the Proteins*," 1923, Ch. II.
(4) Michaelis, "*General Principles of the Effects of Ions in Colloids*," Colloid Symposium Monograph, No. 2, 1925.

Messrs. H. Marsland, W. T. O. Maidment, W. C. Lester-Smith, B. T. Steemson, I. A. Sutherland, J. C. Muir, F. A. Robb and J. C. Cowland, Post-Graduates, left for England on June 30th by the S.S. *Orange Nassau*.

EMPIRE COTTON.

THE RT. HON. THE EARL OF DERBY, K.G., G.C.B., G.C.V.O., C.B.

[*The Fourth Annual General Meeting of the Empire Cotton Growing Corporation was held at the offices, Millbank House, Westminster, on Thursday, 21st May*, 1925. *In the unavoidable absence of the President of the Corporation (the President of the Board of Trade), the Chair was taken by the Rt. Hon. The Earl of Derby, K.G., G.C.B., G.C.V.O., C.B., President of the Administrative Council.*]

You will see in the Report the reasons for holding our Annual Meeting in May instead of October, and I need not, therefore, occupy your time by going through them; it will be obvious, however, that, since my remarks cover a period of six instead of twelve months, I shall not have a great deal to say. Moreover, I am asking Mr. Brackenbury, a member of your Mechanical Transport Sub-Committee, to tell you something of the problem which that Committee are attempting to solve, and Colonel French, your Assistant Director, to say something about the journey he made in East Africa and India during the past winter.

I propose to confine my remarks to bringing the Report of the Council up-to-date in a few particulars.

The slight improvement in the cotton trade which I mentioned last October has continued, but it has not developed as fast as one hoped.

Meanwhile, the general interest in Empire-grown cotton has continued, and I can safely say that the coming crop will again exceed that of last year. According to the figures collected by the Corporation, the number of 400 lb. bales grown in the Empire, exclusive of India, were, in round figures :—

In 1922/23	169,000
,, 1923/24	249,000

The estimated crop for these areas in 1924/25 is 350,000 bales, and, although I put forward some of these estimates with considerable caution, they certainly indicate a steady and satisfactory increase.

Before I leave this subject I should like to refer to a question asked recently in the House of Commons, which, although it did not refer directly to the Empire Cotton Growing Corporation, is, I am sure, of general interest to the Corporation. It was to ask how far the increase in Empire-grown bales of cotton was attributable to the British Cotton Growing Association. In my opinion such a question, whether it referred to the Corporation or to the British Cotton Growing Association, is quite impossible to answer definitely and accurately, now or at any time. It would be idle and foolish to pretend that the increase which I have mentioned is due entirely either to the Corporation or to the British Cotton Growing Association. The direct causes have been the scarcity and consequent high price of the raw material. That it has been possible to increase production so quickly has, I think, been due to the spade-work of these two bodies, and it is to the spade-work that we must look if the increased production is to continue, in spite of a supply that is more nearly equal to the world's demand and a consequent fall in price for the actual grower.

In Australia a good start has been made with the experimental farms mentioned in the Report, and I am glad to learn that most appreciative and informed accounts of the work on these farms have appeared in the Australian press. As you will remember, I laid stress last year on the particular necessity for research in Australia, where it is essential that the cotton grown should be of the highest quality owing to the necessarily high cost of production.

Mr. Evans, the representative of the Corporation in Queensland, has visited Fiji to report on its possibilities as a cotton growing area. He has now been asked by the Commonwealth Government to pay a visit to, and report similarly on, New Guinea.

In South Africa, until quite recently, the prospects were most favourable, but, as in most other parts of the world, there has been an abnormally heavy rainfall late in the season, and we do not yet know to how great an extent this will have had an unfavourable effect on the crop. Your representative, Mr. Milligan, is returning on leave shortly, and will be able to give you full information on this point. There are bound to be occasional set-backs of this sort in Africa, where the only regular feature of the climate may be said to be its irregularity, and where it has been said that the weather is abnormal every year. I do not think, however, that this need shake our faith in the future cotton-growing prospects of that Continent.

From Southern Rhodesia also most encouraging reports were received before the recent heavy rains, and it is likely that we shall see a marked increase in the cotton production there. The ginning machinery mentioned in the Report is believed to have reached Southern Rhodesia by now, and may be on the actual sites of the several factories.

You will remember that when last I addressed you I stated that the political situation in the Sudan was obscure. I need not remind you of the events which followed the murder in Cairo of Sir Lee Stack, the Governor-General, and it is too early for me to prophesy, or even to say that the situation is absolutely stable. As regards cotton, however, there has been continuous progress and endeavour, not only to develop the Gezira as an irrigated area, but to ascertain the possibilities of the Southern Sudan as a rain-grown cotton field. On the whole, the prospects in this direction are very promising, but great transport difficulties must be overcome before it will be possible to export large quantities of cotton from that area. At least we may feel certain that Sir Geoffrey Archer, the new Governor-General, will do everything in his power to make the Sudan rival Uganda, the Protectorate from which he came, in the matter of cotton production.

East Africa has been the subject of two reports of considerable interest to the Corporation, viz., that of the Parliamentary Commission which recently visited Rhodesia, Nyasaland, Tanganyika, Uganda and Kenya ; and that of Colonel French, who will tell you something of his trip. Both these reports are about to be considered by your East African Sub-Committee, with a view to framing specified recommendations in regard to this part of the Continent, and I need not, therefore, anticipate the work of the Sub-Committee. I consider, however, that the Report of the Parliamentary Commission is a monument of hard work by the three gentlemen during their journey. It is full of information and constructive advice regarding the areas visited, and I strongly recommend it to your attention. One member of the Commission, Mr. Ormsby-Gore, has been appointed Under-Secretary of State at the Colonial Office, and he has, therefore, an exceptional opportunity of carrying out his recommendations. You will see that particular stress is laid in this Report on a point to which the Corporation have drawn the attention of successive administrations in the past, namely, on the early provision of increased transport facilities. I hope that if this Corporation can do anything to assist in providing extended transport facilities in East Africa, they will do so to the fullest extent that is within their power, for so far as I am aware, no report with such full local knowledge and with such a clear vision of what will help East Africa as a whole in regard to transport has previously been published.

Both the Commission and Colonel French are impressed with the possibilities of cotton growing in the Lake Victoria Basin. Uganda is now producing close on 200,000 bales, and the extent to which this amount is increased depends on the supply of labour, *i.e.*, of population, and on how far the yield per acre can be improved on the rich soil of that Protectorate. Much might be done by an improvement in the seed, a matter to which the Agricultural Department are paying attention, and no doubt your East African Sub-Committee will consider whether it is possible to offer further assistance to the Uganda Administration.

In Tanganyika, or at all events in Northern Tanganyika, the great difficulty is the enormous area which is rendered practically useless by the presence of bush infested with the tsetse fly. I understand that such bush-country, when cleared and cultivated, is not only freed of fly, but is usually found to have good soil, and I hope that the Colonial Office will consider with the Corporation whether it will be possible to combine governmental action with private capital and native agriculture to fight tsetse fly on a large scale.

I am glad to notice that the Commission have definitely contradicted the oft repeated accusation that Manchester has imposed cotton growing on the natives in her own interests. I have always thought that this was absurd, and have been convinced that, though it might be possible to compel natives to grow a particular kind of crop for a year or two, it would be quite impossible to compel them not only to go on growing it, but to grow it in ever-increasing quantities, unless they rather liked the work, and found that it led to their being able to buy what they want.

In Nigeria, although there does not seem to be a prospect of a very large increase, still the progress is maintained.

I am glad to learn from Sir James Currie that he believes that he has found an excellent man to take charge of the first seed farm that will be established by the Corporation. This is most satisfactory, as it is hoped that subsequently an experienced farm manager will be able to train younger men to take charge of other farms.

Your Executive Committee are about to consider a Report on Trinidad as a possible site for a Central Research Station. This Report was made by Professor Farmer and Mr. Killby, your Secretary, who visited Trinidad during the winter, and I am glad to hear that this important matter has been carried a stage further.

Colonel French is going to tell you something of his visit to India, and I should only like to add that I welcome anything that will strengthen the ties between the Corporation and the Indian Central Cotton Committee. We are anxious to make the co-operation between that body and ourselves stronger and stronger as time goes on, and shall always be ready to do anything that we can to assist them at this end.

Finally, I would remind you that the constant need in all parts of the Empire is for trained men. I am glad to learn from Colonel French that the Uganda Administration are exceedingly pleased with the young men trained by the Corporation and sent to them last year, and consider them a strong and excellent reinforcement to the Agricultural Department in the Protectorate.

There is no doubt that the Corporation could place as many men as they train. It is satisfactory, therefore, to hear that the Executive Committee have agreed to accept this year as many candidates for Studentships as are found to be qualified and suitable for employment. Unfortunately it will be some years before our Students can be regarded as experts, and experts are the men most needed at this moment. I hope that the labours of the late Lord Milner's Committee, which is considering the needs of colonial agricultural services, will bear fruit in popularising and strengthening that service which is second to none in importance in tropical Africa and other fields where cotton can be grown. I should like to ask you to join with me in expressing our feelings of the loss to ourselves and to the Empire as a whole that we have sustained by the death of Lord Milner. Lord Milner was a personal friend and a colleague of mine. I know nobody who had at heart the interests of the Empire more than he had, and he did much to strengthen the ties that bind the various parts of the Empire together.

The standard of colonial agricultural services cannot be too high, and I am sure that the more use that is made of the Imperial College of Tropical Agriculture in Trinidad the better and higher will be that standard. The Corporation have already contributed generously to the College, and I would appeal to all who are interested in tropical agriculture to contribute towards the needs of the College.

BANANA CULTIVATION.

PROF. J. S. DASH, B.S.A.

[*The following is the conclusion of Professor Dash's article, the first part of which appeared in our last issue.*]

8.—After-treatment.

Cultivation.—Next to timing and pruning in importance comes the management of the soil during the life of the plantation. In the early stages of its existence, temporary crops may be grown either as nurse crops to give protection from wind or for mulch and weed control. We have found pigeon-pea, thickly broadcast, useful in this connection; when three months old most of it should be cutlassed to form a mulch, a few plants being retained as temporary windbreaks. As a low growing cover crop we have also tried peanuts successfully. It must be emphasized that such practices can only have very limited application or the soil may be robbed of some of its fertility and moisture which will be needed later for fruit formation. The straw mulch is especially recommended in situations of low rainfall, particularly in the dry season, a thick one helping to keep down weeds, trouble from which may be anticipated under most conditions unless extraordinary care has been taken in the preparation of the land before planting. From a heavy smother crop like Bengal or Sword bean the greatest service will be obtained if sown in thrown out fields, when the vines will cover the old stumps and suckers, thus hastening their decay, the whole mass being turned in and allowed to decompose a little time before the field is replanted.

The question of tillage will have to be envisaged, its nature depending on the type of soil. If light and friable, shallow cultivations only will be necessary and these infrequently; at the College, a light forking 4 to 6 inches deep has so far been given twice a year with advantage—before mulching and again as soon as the rains come in. With heavy soil deeper cultivation and even subsoiling may be found necessary to break it up periodically, thus ensuring proper drainage and giving the feeding roots more freedom. Cutting through the roots seems to do no harm but rather stimulates them into greater activity; if done frequently too close to the plants a check may be given to any bunches in course of formation. A series of experiments on this question of tillage on heavy soils in Trinidad should yield most valuable results.

Manuring.—Nothing has so far been used in the College plots but farmyard manure. Some of our mulching material consists of strawy manure and waste of various kinds. The conclusion arrived at in Jamaica as the result of experimental work is that bananas do not require fertilizers; humus, lime and drainage are the chief factors of practical importance. As to liming, this would appear to be necessary especially where Panama disease is present and under Trinidad conditions attention will have to be given to it. Ground limestone at the rate of 2 tons to the acre would constitute a fair dressing applied every four years, that is at replanting time.

Pruning leaves.—As the older leaves cease to function actively they tend to fall and hang around the trunk. It is better not to remove them all as they help to protect the pseudo-stem from the drying effects of the sun and wind. In closely planted groves they may have to be regularly trimmed off along with some of the living green leaves if there is a tendency to too much shading. As a general practice, remove no leaves unless they have entirely dried up. Watch should be kept for any leaf which by its position is liable to cause injury or discolouration to a bunch when it should be carefully pruned off.

9.—Harvesting.

In this operation the top of the plant is partially cut about 5 to 6 feet from the ground to allow of its gradual fall. With the weight of a bunch (50 to 60 lbs.) attached, care is necessary to prevent damage or injury to neighbouring plants. The bunch is caught and severed, then wrapped in trash to prevent bruising during its carriage to the collecting bases for grading prior to disposal. Every precaution must be taken in the handling of fruit for shipment, which is usually cut about three weeks before it is ripe and when the fingers are still slightly angular. A little practice soon enables one to judge when a bunch is ready for harvesting.

The stems and leaves of the old plants are finely cut up and spread over the soil; the old stump is left to dry out before being removed, as any moisture it contains is beneficial to the remaining plants. If left too long, however, it may harbour weevils. Care is necessary in its removal so as not to injure the plants or expose the soil too much, the hole being filled in immediately. Sometimes, young shoots are given off from small corm-like tubers on these old root stocks; they should never be retained for fruit, being in the category of maiden suckers.

10.—Pests and diseases.

A complete discussion of the pests and diseases of the banana does not come within the scope of this paper. Two of the worst troubles, namely, Panama disease (*Fusarium cubense*) and banana weevil (*Cosmopolites sordidus*) have been referred to and certain lines of action recommended in dealing with them. In the case more particularly of Panama disease, any signs of wilting plants should be promptly reported to the agricultural authorities so that competent advice may be given. In Jamaica, rigid quarantine and isolation measures have been enforced and a large number of inspectors employed to deal with cases. A number of other pests and diseases are met with but so far as the West Indies are concerned they may be regarded as of minor importance.

11.—Returns.

It is usual in dealing with the question of yield to speak in terms of "payable bunches" or "straights," that is bunches of nine hands. For the export trade, eight hand bunches are considered as three-fourths the value of nine hand, seven hand one-half and six hand one-fourth. Under ordinary conditions it is hardly probable that an average yield of 250 "straight" bunches per acre per annum will be exceeded. In this connection, plants will yield a lower percentage of such bunches than first ratoons. In a good banana section in Jamaica it is reported possible to get 330 "payable" bunches over a seven year period. Under those conditions 66 to 70 per cent. of the plants and 88 to 90 per cent. of first ratoons give "straights." I have no doubt that in some parts of Trinidad it might not be difficult to secure such yields ; in the vicinity of St. Augustine, even 250 seems entirely out of the question. In our first trials only a very small number of plants gave nine hand bunches, increasing in the first ratoons in the case of Giant Fig to between 30 and 40 per cent. From the acre now being planted to this variety at the College, it should be possible to collect more data in regard to this particular point. Future success will depend on how far these soils can be converted into real banana land by additions of large amounts of humus that will absorb and retain the annual precipitation which is below that required for the most profitable commercial banana production. In addition, there is the wind factor to be considered.

Mr. Scudamore of the United Fruit Co. when in Grenada gave as the cost of bringing one acre to bearing in Jamaica as £15. Figuring on 250 count bunches at 2*s*. (the average price in Jamaica over the past twenty years is 1*s*. 8*d*.) the return would be £25, leaving a profit of £10 per acre. He estimated the cost in Grenada over a three year period including cost of cultivation, reaping and transport as £42 per acre, which if it yields 750 bunches at 2*s*. in the three years would give a gross return of £75. Deducting £42, we have a net profit of £33 or £11 per acre per annum. Figures recently published by the Department of Agriculture, Trinidad, show the cost locally to be about £13 per acre on land which has been under cultivation to other crops.

The utilization of inferior fruit for subsidiary banana products is worth considering in any development of commercial banana growing. Some of the more important of these are banana chips, meal or flour, banana "figs" or evaporated bananas (the Governor is better for this purpose than Gros Michel) and alcohol. From the sheaths, banana fibre may be obtained and there are also possibilities in the pulp for paper, while the stalks and skins are rich in potash and of considerable value as manure. It is naturally a problem in economics as to whether any or all of these would be profitable.

COTTON RESEARCH.

Proposed Central Station in Trinidad.

THE Empire Cotton Growing Corporation recently appointed a Sub-Committee consisting of Prof. J. B. Farmer, M.A., D.Sc., F.R.S., and Mr. L. G. Kilby, B.A., B.Sc., to report upon Trinidad as a possible site for a Central Cotton Research Station. Before selecting Trinidad as a possible site consideration was given to other areas, particularly Africa, which is the scene of the Corporation's main activities. The Sudan was rejected on account of its trying climate and the special conditions under which the plant is there grown in the irrigation areas, and the Transvaal and Natal partly owing to the comparatively long and expensive journey from England. Outside Africa, Ceylon and Cyprus were among the other places whose claims were fully discussed, but, though possessing certain advantages, these were outweighed by their drawbacks. After exhaustively examining the possibilities of several different parts of the Empire, the Sub-Committee suggested that Trinidad might be found to possess more advantages and fewer disadvantages than any other place.

It was recognised that the presence of the Imperial College with Dr. Leake, whose research work in Cotton in India and Africa is well known, as Principal, and Dr. Harland, with considerable research work in Cotton in the West Indies to his credit, as Professor of Botany and Genetics, would be of great advantage to the Research Station, if it were so situated that they could interest themselves in its work. Moreover, the Experimental work on Cotton carried out at the neighbouring Government Experiment Station and the College, and the reports on rainfall were most encouraging. It was recognised that the fact that Cotton had been grown as a commercial crop in the island on a small scale, and had since been abandoned, might clearly have an important bearing on the proposed station. Sir Francis Watts in a valuable memorandum on the subject (printed as Appendix I to the Report) attributed the failure to three causes ; (1) some of the sites selected have probably the worst soil for cotton in the island ; (2) they were situated in regions with a very high rainfall ; (3) the Cotton was planted so that it matured during the wettest time of the year. The only success achieved was that of Mr. McInroy on the St. Augustine Estate in the neighbourhood of the College where there are several miles of country unquestionably suitable for Cotton in respect of both soil and climate, and it is in this neighbourhood that the Corporation proposes to establish the Station.

The fact that cacao, coconut and sugar-cane have proved, and are likely to continue to prove, more attractive to estate owners, is extremely fortunate, since no difficulties are likely to arise from the risk of hybridizing commercial crops of Cotton from several varieties grown for

experimental purposes, and it at once renders the task of controlling pests easier by the absence of any extensive area from which they can draw their food supplies. Doubts as to climate were set at rest by a comparison of rainfall and temperature records at St. Augustine with similar records for the principal cotton-growing States of America, the chief cotton-growing islands of the West Indies, and also for countries in tropical Africa where the crop is grown.

Fortunately there is an area of about 60 acres within 500 yards of the College which the Corporation will be able to purchase from the Government and private owners. This would enable a small isolated sub-station to be established as an insurance against the total loss of material by pests or diseases. Crop rotation can be practised and any small profit realised from the sale of commercial crops, such as sugar-cane, offset against the expenses of research. Such an area would allow for expansion of the work and always permit at least 20 acres to be devoted to cotton cultivation.

Prof. Harland presented a comprehensive scheme of work for the Station. From this the Committee selected cotton genetics and physiology as the subjects most urgently demanding research, and as those which would form a nucleus from which other work would grow. Genetics is considered as of first importance. It is rightly emphasized that it would be a waste of money and resources to select for such a post any but a really first-rate man, possessing not only recognised scientific ability but also a capacity for organising and handling junior staff and workers.

Next in importance to genetics is the need for a plant physiologist. The relations of the plant to soil, to climatal and general physical environment, and the connections between water, whether as rainfall or soil water and the yield, together with the quality of the crop, are still imperfectly understood, and urgently call for investigation. Such work cannot but prove to be of high importance in the commercial production of cotton. Such physiological investigations whether from a laboratory or a field point of view, must be somewhat expensive on account of the instruments and apparatus required for such work, but is clear that the necessary expenditure should be incurred. Researches of this kind are almost necessarily prolonged, and quick results should not be expected.

It will readily be recognised that the results obtained at the Central Station will not necessarily, or even probably, be found to hold without modification in other regions where the soil and climate may be very different, but nevertheless the basic principles discovered will be of very wide application. The station should be Central not merely in name but should also serve as a means of suggesting appropriate investigations to be conducted in other cotton growing lands, where the different factors of climate, soil, &c., which may influence the actual behaviour of the cotton plant in such countries, may be carried out, perhaps under advice from the Central Station. Even qualities of cotton which may be regarded as " genetically fixed " may be found to be affected by climatal variations. This opens up the whole question of acclimatization. The Report visualized the possibility of members of the staff in the Central Station being detailed for service to solve special problems elsewhere and, with the accumulating knowledge which such officers would be able to bring to bear upon the subjects, such mutual contact should be of the greatest importance to the cotton-growing industry as a whole. The Central Station should in fact become the clearing house for all cultural problems and the overwhelming advantage of possessing a specialized and skilled Staff, accustomed to deal with this class of investigation, available for such service, needs no further emphasis. The scientific work already done in connection with the cotton plant and its lint emphasizes how much more still remains to be elucidated in the fundamental conditions which govern the growth of the plant and influence the properties of its fibre.

The two principal members of the Staff will, then, be a Geneticist and a Physiologist. Instead of a whole-time Director of the Station it is proposed that a local Committee of Management consisting of Dr. H. Martin Leake and Mr. W. Nowell should be appointed to guide and co-ordinate the work of the Station and to report to the Corporation. It should be emphasized that these two gentlemen would act in a purely private capacity and not as representatives of the organizations to which they are attached, as it is essential that the Station should be entirely autonomous and in no way under the direction either of the College or the Local Department of Agriculture. It is suggested that the Staff should consist of a Physiologist and a Geneticist, each with a senior, a junior and a non-graduate assistant. In addition a computing clerk, a filing clerk and typist, and five laboratory assistants together with a number of semi-skilled labourers would be necessary as a nucleus subject to subsequent expansion as the Station develops.

As a consequence of the establishment of the Central Station it is proposed that the experimental work now carried on in St. Vincent by the Corporation should eventually, though not immediately, be discontinued. Arrangements are suggested by means of which the Central Station could be kept in close touch with the Universities and similar Institutions at home and the Experiment Stations in Cotton-growing lands within the Empire.

Both the College and the Colony have reason to congratulate themselves upon the choice of Trinidad as a site for the Research Station. The Corporation has recognised the advantage of the proximity of the Station to the College while the College, on the other hand, will derive considerable benefit from the situation of the Station, particularly in connection with the post-graduate students sent out by the Corporation to the College for training, for they will be brought into intimate contact with the work of the officers of the Station with whom the closest connection will afterwards have to be maintained.

BOOK REVIEWS.

CHAMBERS OF COMMERCE ATLAS.—Specially prepared for the *Times Trade and Engineering Supplement*. Issued under the auspices of the Association of British Chambers of Commerce. Edited by GEORGE PHILIP, F.R.G.S., and T. SWINBORNE SHELDRAKE. GEORGE PHILIP & SON, 16" × 11" price £2 12*s*. 6*d*. and £3 13*s*. 6*d*.

THIS handsome Atlas is the last word in the graphic representation of statistical matter. The value of such presentation depends on the accuracy of the data ; and the list of authorities quoted should be a guarantee of this.

In the checks we have applied we have only failed in one instance, namely to trace the main ports of import of different forms of produce ; this, however, may be a query which it is hardly fair to make of an atlas dealing with the world's trade.

The 16 general major maps, covering political division, data concerning mankind, trade and bourses and water power are followed by 7 dealing with sea communication, 42 with commodities of commerce and 47 illustrating the commercial development of the principal countries of the world. Throughout the classification is "K" dual system adopted by the Association of British Chambers. A useful commercial compendium is attached.

H. MARTIN LEAKE.

"SOUTHERN RHODESIA" Handbook for the use of Prospective Settlers on the Land. Issued by direction of the Hon. the Minister for Agriculture and Lands. pp. 74 with 5 maps.

We have recently received a small handbook on Southern Rhodesia intended for the use of prospective settlers on the land. Special attention is given to the natural features, the method of taking up land, and the principal crops grown together with the chief insect pests affecting agriculture. Animal industries occupy a prominent space. Other useful information of a general nature is given concerning education, cost of living, business and social facilities, prospects, &c., and the routes by which Southern Rhodesia can be reached. Maps showing the position of the Colony relative to other parts of the world, rainfall distribution, orographical, geological and mineralological features are also included. Southern Rhodesia is the youngest self-governing colony of the Empire, having assumed responsible Government as recently as the 1st October, 1923, being previously administered by the British South African Company. This book is well written, interesting, couched in reasonable language and eminently suited to the purpose for which it was written.

C. Y. SHEPHARD.

COLLEGE NEWS.

THE Principal returned from England on the 27th June by the S.S. *Venezuela*.

Professor Ashby has been elected as the representative of the Academic Board on the Governing Body of the College for the year ending June 30th, 1926.

The members of the Lion's Club, the Post-Graduate Club at the College, wish to thank all those who have on the many occasions so generously and successfully entertained them during the past academic year.

Professor S. F. Ashby sailed for England by the S.S. *Motagu* on the 23rd June, on vacational leave. Professor F. Hardy accompanied by Mrs. Hardy also left for England by the S.S. *Orange Nassau* on the 30th June.

Messrs. A. H. McKinstry, D. R. D. Wiles and C. H. B. Williams, Diploma Students, sailed for Barbados by the S.S. *Chignecto* on the 27th June.

In the article on the Instructional Sugar Factory published in the Supplement with our April issue, it should have been stated that the three Crystallizers, Strike Mixer, the two Centrifugals and Accessories were the joint gift of Messrs. Watson, Laidlaw & Co., Ltd., and Messrs. Pott, Cassels & Williamson.

Dr. S. C. Harland, Professor of Botany and Genetics, the member of the College staff chosen to visit the East for investigations connected with Panama diseases of bananas, sailed from Trinidad on June 27th on the S.S. *Venezuela*. He will visit Panama, California and the Philippines, and in addition to the banana investigations Dr. Harland is to study limes with a view to finding some means of controlling withertip disease. This investigation has been rendered possible by a grant from the Colonial Research Committee to cover expenses.

The Sessional Examinations concluded on Friday, 26th June. The following students passed their 3rd Year Examination and have become eligible to receive the College Diploma.

B. COURSE—(Agricultural Sciences).
Mr. S. H. Evelyn.
,, A. H. McKinstry.
,, C. H. B. Williams.

C. COURSE—(Sugar Technology).
Mr. V. I. Mulloon.
,, D. R. D. Wiles.

The following students passed their 2nd Year Examination.

A. COURSE—(Estate Management).
Mr. H. D. Huggins.

C. COURSE—(Chemical Technology).
Mr. J. C. Davies.
,, H. B. Springer.

The following students passed their 1st Year Examination.

Mr. L. A. Blanc.
,, J. A. Potter.
,, J. A. McDonald
,, R. M. Stevens.

TREND OF THE MARKETS.

[*The notes below are based principally upon running charts of the prices of the basic grades and upon general statistical information gleaned from contemporary publications and cablegrams and are intended to be a record of movements. An attempt is made, where possible, to indicate the market outlook at the time of going to press, but no responsibility for the accuracy and subsequent truth of such observations is assumed. Unless otherwise stated the prices quoted are spot, London.*]

SUGAR.—The final returns of world production of sugar for the year ending April 30th, 1925, are officially estimated at 17,312 million lb. of beet and 29,173 million lb. of cane, compared with 12,828 million lb. of beet and 28,809 million lb. of cane for the previous year. The low prices ruling are self explanatory. Cubes realised 35*s.* per cwt. and West Indian Crystallized 28*s.* 9*d.* per cwt. on June 17th.

COTTON.—The American Bureau reports crop condition on May 25th at 76·6 per cent., a figure considerably higher than had been expected, with the consequence that the market has adopted a bearish tone. The corresponding figure for last year was 65·6 per cent. and the average for the last ten years 72 per cent. The May condition is, however, probably the most unreliable and considerable modifications may be expected. Middling American closed at 13·55*d.* on June 18th.

CACAO.—Sales include Ceylon Ordinary at 100*s.* per cwt., Trinidad Mid Red at 76*s.*, Grenada Fine at 62*s.* 6*d.* and Accra Fermented at 37*s.* 6*d.* on June 17th. Stocks in bond are practically the same as at this time last year.

COFFEE.—All types have shown a tendency to decline with some inclination to recover at the beginning of June. Prices on June 17th included, Costa Rica Middling 168*s.*, East Indian Mysore Middling 148*s.*, Kenya Good Middling 138*s.*, and Brazil Santos 104*s.*, each per cwt.

TEA.—Indian tea remains strong, but Ceylon and Java show a slight tendency to decline. Averages on June 17th were, Ceylon 19·81*d.*, Indian 18·00*d.*, Java 11·84*d.*, each per lb.

SISAL AND HEMP.—Both sisal and hemp have declined somewhat sharply in price, Manila hemp falling from £46 per ton on May 20th to £41 10*s.* on June 17th, and Prime Sisal from £43 10*s.* to £42 10*s.* on the same dates. Prices for Manila still show an advance of 40*s.* to 50*s.* per ton over the corresponding figures of last year.

RUBBER.—The rise in rubber prices continues and stocks have now fallen to 5,456 tons. The average price to date is 30·25*d.* per lb., but sales have touched 39*d.*

RICE.—All kinds of rice, after falling a little towards the end of May, shewed a rise of about 6*d.* per cwt. during the 2nd week in June, when prices were 36*s.* 3*d.* for Carolina and 15*s.* 3*d.* for Burmese each per cwt.

COPRA.—A steady rise in price had been experienced during May, followed by a slight relapse during the first two weeks in June, when F.A.Q. Ceylon to London realised £31 17*s.* 6*d.* per ton, Sun-dried Straits to Rotterdam £30 7*s.* 6*d.* and Straits to Marseilles £29 5*s.*

EMPIRE SUGAR FEDERATION.

IN the last issue of this Journal we published details of the preference which the Imperial Parliament has conferred upon Empire Sugar. This preference should be regarded not so much as a subsidy to producers as a definite guarantee of a market for British Sugar within the United Kingdom, and more particularly as an encouragement to greater production within the Empire until our whole needs can be met from British sources.

The British Empire Producers' Organisation has not been slow to recognise these facts and has despatched a circular letter to all British Sugar organisations urging them to federate for the purpose of amplifying and intensifying the work already carried on by the organisation. It is suggested that the objects of the federation should include the following :—

(*a*) To increase and improve the production of sugar in the British Empire.

(*b*) To secure for the producers preferential terms in all Empire markets, having in view the very favourable treatment accorded by foreign countries to their National or Colonial producers, and to arrange that wherever possible such terms shall take the form of money value preferences in import duties stabilised for a period of years.

(*c*) To arrange for the thorough understanding of Empire sugar questions by as large a number as possible of the members of legislatures, both in Great Britain and the Empire Overseas.

(*d*) To arrange publicity and propaganda to stimulate the public demand for Empire grown sugar.

(*e*) To act as an Enquiry Bureau in regard to all matters affecting sugar and to keep its constituent members in touch with the latest information, scientific, industrial, and economic, and to advise them when required in regard to markets and marketing methods.

(*f*) To promote for the benefit of its members research in the growing and manufacture of sugar and the study of the scientific production and industrial application of sugar by-products of all kinds.

(*g*) To make such arrangements as to marketing as may be of advantage to the industry as a whole and in this behalf to come to an agreement with the sugar using industries or any section of them.

It is suggested that the funds might be provided on the basis of production and that an annual amount at the rate of 3*d.* per ton produced should be subscribed by each producing part of the Empire.

Readers desiring to complete their files of *Tropical Agriculture* can obtain copies of all previous issues with the exception of Vol. I, No. 9, and Vol. II, Nos. 1, 2 and 3.